2008 Annual Plan for the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program

DOE/NETL-2008/1306

Provided in Response to Energy Policy Act of 2005

Subtitle J, Section 999

January 2008
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Executive Summary

This document is the *2008 Annual Plan* for the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Research and Development Program (Program) established pursuant to Subtitle J, Section 999, of the Energy Policy Act of 2005 (EPAct).

EPAct required the Department of Energy (DOE) to competitively select and award a contract to a consortium (Consortium) which in turn is to administer three elements of the Program pursuant to an annual plan. A fourth program element of complementary research will be performed by the National Energy Technology Laboratory (NETL). NETL is also tasked with managing the Consortium.

The Consortium provided its recommendations for the *2008 Annual Plan* in the form of a "draft annual plan" (DAP). These recommendations are included in this *2008 Annual Plan* (Appendix C). The Ultra-Deepwater Advisory Committee (UDAC) and the Unconventional Resources Technology Advisory Committee (URTAC) will provide a review and comments, and the Advisory Committee reports will be appended to the *2008 Annual Plan (*Appendix D). Advisory Committee recommendations for the *2007 Annual Plan* Draft were accepted and either incorporated into the *2007 Annual Plan*, reserved for inclusion in subsequent plans, addressed by the NETL Complementary Research Program, or addressed within the Traditional DOE Program.

In late 2006, NETL awarded a contract to the Research Partnership to Secure Energy for America (RPSEA) to function as the Consortium. RPSEA began the work of the Consortium effective January 4, 2007. NETL worked closely with RPSEA in the of the program. RPSEA gathered extensive input through industry workshops, road mapping sessions, and expert opinion to develop its first DAP, and identified priority areas for the investment of $32 million per year on Consortium awarded R&D.

EPAct identifies three program elements to be administered by the Consortium: ultra-deepwater architecture and technology, unconventional natural gas and other petroleum resources exploration and production technology, and technology challenges of small producers.

In the *2008 Annual Plan*, the Ultra-Deepwater Program Element is divided into theme areas based on four generic field types that represent the most challenging field development scenarios facing deepwater operators. The Consortium is soliciting research and development (R&D) projects that seek to develop technologies that will facilitate development of these field types. Additionally there are eight crosscutting challenges that represent the areas where new technologies are needed to advance the pace of ultra-deepwater development for all fields. The Consortium will also solicit projects that seek to advance technologies in each of these areas as components of an integrated system.

The Unconventional Natural Gas and Other Petroleum Resource Program Element is divided into three theme areas that target gas shales, water management for both coalbed methane and gas shales, and tight sands. As in the *2007 Annual Plan*, the *2008 Annual Plan* focuses on unconventional natural gas where R&D to help convert resources into reserves is needed. Unconventional oil resources may become an additional focus of Consortium R&D in the future; however, they are currently being addressed within the NETL Complementary program.

The Small Producers Program Element targets advancing technologies for mature fields, which primarily covers the technology challenges of managing water production, improving recovery, and reducing costs. Mature fields are the domain of small producers, and they face these three challenges on a daily basis.

For each of these program elements, a number of "themes" have been developed to help guide the Consortium through their solicitation process. These themes and the prioritization process are provided in greater detail in Sections 2.1, 2.2, and 2.3 of the *2008 Annual Plan*. The solicitation process that is being followed to generate the portfolio of R&D projects to address these themes is described in Section 2.4.

The *2007 Annual Plan* was completed and published in the Federal Register in August 2007. Subsequently, the first solicitations under the Consortium Program were released in mid-October 2007, with proposals received in early December 2007. Other solicitations followed in November 2007. Proposals received to date are under review and project selections are expected in February 2008. The primary focus of the *2008 Annual Plan* is to continue to release solicitations and award R&D projects.

Technology transfer is also an important focus for 2008 and will be carried out in a manner that disseminates R&D results to the widest possible audience. Section 999C(d) of EPAct 2005 requires 2.5% of the amount of each award to be designated for technology transfer. The funds will target technology transfer at both the project and the program level. The expenditure of these funds will initially be proposed by the awardees. RPSEA and the awardees will then work together to develop an appropriate approach which fulfills both the project and program technology transfer requirements. In the broader context, NETL and RPSEA are continuing to coordinate in the development of a technology transfer plan that provides a systematic approach for development of an integrated technology transfer program, understanding that this will be a continually evolving function. The initial plan is presented here in Section 2.6

Frequent communication between NETL and RPSEA ensures that all program elements remain complementary and supportive, and that duplication of effort is avoided. In addition, EPAct 2005 Section 999H(d)(4) requires establishment and operation of a technical committee to further ensure that the R&D efforts remain complementary.

The NETL Strategic Center for Natural Gas and Oil is responsible for overall management of the Consortium. The Complementary Program is being carried out by NETL's Office of Research and Development. Planning and analysis, including benefits

assessment and technology impacts analysis, is being carried out by NETL's Office of Systems, Analysis and Planning.

1. Background

1.1 Energy Policy Act of 2005: Section 999

In August 2005, President Bush signed the Energy Policy Act (EPAct) into law; EPAct was the first national energy legislation in more than a decade. EPAct Sections 965, 968, and 999 all address oil and gas R&D. Sections 965 and 968 relate to programs that DOE's Office of Fossil Energy and the National Energy Technology Laboratory (NETL) are already implementing. Section 999, however, adds a new dimension to the overall DOE oil and gas R&D effort, enhancing opportunities to demonstrate ultra-deepwater and unconventional technologies in the field and accelerate their implementation in the marketplace. The complete text of Section 999 is included in Appendix A.

The Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Program launched by Section 999 is a public/private partnership designed to increase America's domestic oil and gas supply and reduce dependency on imports. A portion of the funding is directed towards cost-shared research partnerships, while another portion is used by NETL to carry out complementary R&D.

EPAct Section 999 states in Section 999A(a), Section 999B(a), "[T]he Secretary shall carry out a program under this subtitle of research, development, demonstration, and commercial application of technologies for ultra-deepwater and unconventional natural gas and other petroleum resource exploration and production … to maximize the value of natural gas and other petroleum resources of the United States, by increasing the supply of such resources …." The legislation identifies NETL as the DOE entity responsible for review and oversight of the resulting Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Program. The legislation further states in Section 999B(c) that "[T]he Secretary shall contract with a corporation that is structured as a consortium to administer the programmatic activities …."

Section 999 sets the funding for this program at a level of $50-million-per-year over 10 years, provided from Federal lease royalties, rents, and bonuses paid by oil and gas companies. The funds are to be directed towards research specifically targeting four areas: ultra-deepwater resources, unconventional natural gas and other petroleum resources, technology challenges of small producers, and fundamental research complementary to these areas. The complementary research is being performed by NETL, while all other research is administered by the consortium overseen by NETL. See Table 1.1 for a breakdown of funding as directed by Section 999.

1.2 Overall Implementation Scheme

NETL is responsible for managing the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources Program. Within NETL, the responsibility for overall program management has been assigned to the Strategic Center for Natural Gas and Oil (SCNGO). Complementary R&D is being carried out by NETL's Office of Research and

Development (ORD). Planning and analysis related to the program, including benefits assessment and technology impacts analysis related to program direction, are carried out by NETL's Office of Systems, Analysis and Planning (OSAP).

A. Consortium Selection

In accordance with Section 999, and as ordered by the Secretary, NETL issued a competitive solicitation for a consortium to administer the research specified by the legislation. The Research Partnership to Secure Energy for America (RPSEA), a 501(c)(3) not-for-profit corporation consisting of over 120 member organizations, submitted a proposal and in May 2006 was selected by DOE to administer the distribution of about $32 million per year in R&D contracts (Table 1.1). The Federal Government will maintain management oversight of the program, and RPSEA's administration costs are limited to no more than 10 percent of the funds.

Area	Allocation	Area Funds	NETL Mgmt. 5%	RPSEA Admin. 10%	R&D Funds for Distribution
Ultra-deepwater	35%	17,500,000	875,000	1,662,500	14,962,500
Unconventional and Other	32.5%	16,250,000	812,500	1,543,750	13,893,750
Small Producers	7.5%	3,750,000	187,500	356,250	3,206,250
Consortium Total		37,500,000	1,875,000	3,562,500	**32,062,500**
Complementary	25%	12,500,000	0	0	12,500,000
Sec 999 Total	100%	50,000,000	1,875,000	3,562,500	44,562,500

Table 1.1: Distribution of Funds as Directed by Section 999 (US$)

RPSEA has a broad membership base that includes representatives from all levels and sectors of both the oil and gas exploration and production (E&P) and oil and gas R&D communities (see Appendix B). Roughly 19 percent of the RPSEA membership is made up of small and independent oil and gas producers, 6 percent are large producing companies, 20 percent are universities, 31 percent are technology development companies of all sizes, 11 percent are national labs or research institutes and the remaining 13 percent are other organizations involved in the oil and gas industry. This breadth of membership helps ensure that consortium-administered R&D funds are directed towards key problems in ways that leverage existing industry efforts. A variety of advisory committees drawn from this membership are incorporated into RPSEA's planning process, as well as in the recommendation of R&D projects to be awarded and the review of project results.

The industry consortium approach enhances the overall program in other ways as well. The companies, universities, and other organizations that receive funds through this program will provide cost-share contributions of at least 20 percent of total project costs, magnifying the impact of the public investment. The inclusion of universities and other

research institutions in this program helps to ensure the continued development of America's intellectual capital, particularly in areas of engineering, geophysics, materials science, and other basic sciences. Finally, the wider involvement of industry partners in all phases of the oil and gas R&D process will dramatically increase the likelihood of near-term demonstrations of technologies developed by the program, a key step in accelerating the movement of these technologies into the marketplace.

B. Planning Process

In late 2006 NETL awarded the contract for RPSEA to begin its work with an effective date of January 4, 2007. RPSEA immediately began preparing its first Draft Annual Plan (DAP), which was submitted to DOE on April 3, 2007. The RPSEA 2007 DAP, as received, was included as an Appendix to the 2007 Annual Plan (DOE/NETL-2007/1294) published in the Federal Register in August 2007. Key elements of the 2007 Annual Plan have been incorporated into this document, with some modification. In addition, RPSEA's subsequent input into this 2008 Annual Plan, in the form of comments and suggested changes to the 2007 Annual Plan, are provided in Appendix C.

Also in late 2006, NETL began a process to develop a plan for carrying out the complementary research specified by Section 999, as well as a management and oversight plan for overseeing both the consortium and the complementary in-house R&D activities. The results of that effort were incorporated into Section 3 of the 2007 Annual Plan.

Each year, the annual plan for the consortium-administered research program must be approved by the Secretary of Energy before the solicitation of R&D project proposals can begin. Prior to submitting the annual plan to the Secretary, the legislation calls for DOE to gather input on the plan from two Federal advisory committees formed by DOE. The legislation allows for input from other industry experts as well. These two committees are the Ultra-Deepwater Advisory Committee (UDAC) and the Unconventional Resources Technology Advisory Committee (URTAC). DOE's Office of Fossil Energy is responsible for organizing both of these committees. This approach is designed to bring together a broad range of ideas, to ensure that the program of research returns the maximum benefit to the Nation. The recommendations provided by the UDAC and URTAC relative to the 2007 DAP were accepted and either incorporated into the 2007 Annual Plan, reserved for inclusion in subsequent plans, addressed by the complementary research program element, or addressed within the traditional DOE research program. The comments received from these advisory committees related to the 2008 Annual Plan will be included as an Appendix in the final version of the 2008 Annual Plan document.

Upon his approval of the annual plan, the Secretary of Energy must transmit the plan to Congress, along with the recommendations of the consortium and the advisory committees.

The annual plan will include details of ongoing activities, a list of solicitations (including topics of R&D, selection criteria, duration of awards, and anticipated funds), and a list of awards made.

C. RPSEA Structure and Consortium Plan Development

Key features of RPSEA's organization are illustrated in Figure 1.1. The make up of the Board of Directors (BOD) and the external advisory committees and groups are provided in Appendix B, and their respective roles are described below:

Board of Directors (BOD) - In addition to operational oversight, the BOD provides significant input and direction to the preparation of the RPSEA DAP.

Strategic Advisory Committee (SAC) - RPSEA established the Strategic Advisory Committee (SAC) to provide strategic direction, advice on the shape of the research portfolio, long range planning recommendations, and metrics determination to the BOD and to the President. The SAC is comprised of a group of industry leaders in the energy field, including both RPSEA members and non RPSEA members. The SAC provided guidance regarding the process used to develop the RPSEA DAP, the proposed R&D portfolio, and the metrics to be used to track progress toward program goals.

Environmental Advisory Group (EAG) - The Environmental Advisory Group (EAG) is designed to provide all program elements with advice regarding environmental issues. The EAG organizes and brings together key individuals from academia, regulatory entities, non-governmental organizations and industry for road mapping exercises to identify key regulatory barriers/issues.

Program Advisory (PACs) and Technical Advisory (TACs) Committees - The roles of the PACs and the TACs are described in Section 2 of this document, as they are specific to their program element. Generally, the PACs provide recommendations on elements of the proposed plan, review proposals and recommend project selections. The TACs provide subject specific technical advice on the development of the proposed plan and on proposal reviews at the direction of the PACs.

Small Producers Research Advisory Group (RAG) - The Small Producer program element will receive guidance from a Small Producer Research Advisory Group (RAG) consisting of industry and academic representatives that are closely tied to the national small producer community. The RAG will follow each project's progress, plans and results and especially technology transfer. All projects will be reviewed by the RAG semi-annually.

While the RAG will be responsible for directing the Small Producer program, the Unconventional Onshore PAC will remain responsible for oversight of the entire onshore program, which includes the small producer program element.

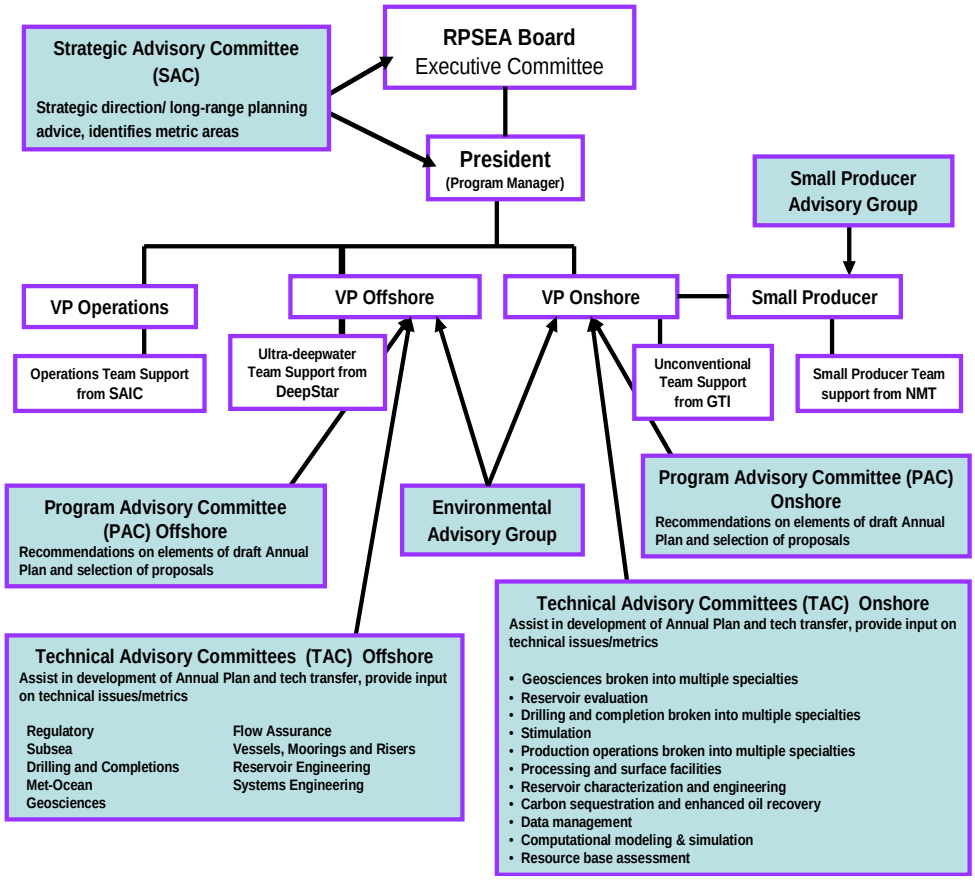


Figure 1.1: Organization of RPSEA and Advisory Committee Relationships

RPSEA has been operating as a consortium since 2002. Additionally, RPSEA has contracted with four organizations, the Chevron administered DeepStar Consortium (DeepStar), Gas Technology Institute (GTI), SAIC, and New Mexico Tech University (NMT), as part of its management team.

During development of its initial DAP submitted in early 2007, RPSEA received input from its member organizations as well as from a broad spectrum of additional experts. Input was solicited and/or developed from:

- 11 RPSEA Member Forums held in various regions of the country. While RPSEA members hosted the forums, participation was not limited to RPSEA members. Member Forums included 613 individual participants representing 193 organizations with interests in technologies to enhance domestic natural gas and oil production. Additional forums are currently being planned in order to secure input to future plans and R&D solicitations.
- The Academic Community. Universities served as hosts of all the RPSEA Member Forums. Nearly 50 individuals representing over a dozen universities have registered or participated in TAC meetings, and universities are represented on the Unconventional Onshore PAC.

- Multiple individual meetings and contacts with individual RPSEA members.
- RPSEA's Offshore and Onshore PACs and the Small Producer RAG for general guidance, the various Technology Advisory Committees, and the Strategic Advisory Committee.
- Multiple road mapping exercises conducted by DOE, RPSEA, and others prior to 2007.

The process of integrating these inputs is illustrated in the schematic shown in Figure 1.2.

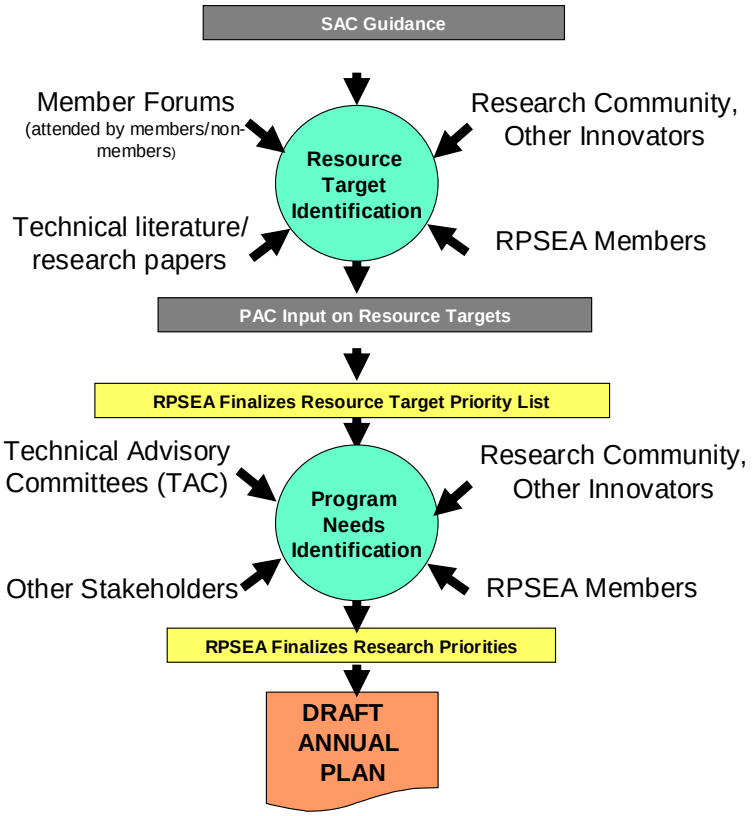


Figure 1.2: Process Leading to Initial RPSEA Draft Annual Plan

RPSEA continued to receive input from its member organizations as well as from a broad spectrum of additional experts, during development of its input for this 2008 Annual Plan.

2. Consortium R&D Plan

Section 999 of EPAct specifies that the consortium selected by DOE is to administer a program of research, development, demonstration, and commercialization in three of the nation's most promising—but technically challenged—natural gas and petroleum resource areas:

- ***ultra-deepwater*** (UDW) areas of the Outer Continental Shelf,
- ***unconventional natural gas and other petroleum resources***, with unconventional being defined as "economically inaccessible," and the
- ***unique technology challenges of small independent producers***.

Further, cross-cutting all elements of the program is a focus on the environment, including projects that minimize or mitigate environmental impact or risk, mitigate water usage, reduce the "footprint" of E&P operations and lower emissions.

Each of these three Program Elements is individually outlined in the plan that follows.

2.1 Ultra-Deepwater Program Element

A. Mission

The mission of the Ultra-Deepwater (UDW) element of the consortium-administered R&D program is to identify and develop economically viable (full life cycle), acceptable risk technologies, architectures, and methods to explore for, drill for and produce hydrocarbons from UDW and formations in the Outer Continental Shelf (OCS) deeper than 15,000 feet.

This mission of technology development encompasses (not in order of priority):

- *Extending basic scientific understanding,*
- *Developing "enabling" technologies,*
- *Enhancing existing technologies to help lower overall cost and risks, and*
- *Pursuing "Grand Challenges"* (transformational technologies which, if successfully developed, are capable of "leapfrogging" over conventional pathways).

Relevant EPAct definitions for the UDW program element include:

- *Deepwater* -- a water depth that is greater than 200 but less than 1,500 meters.
- *Ultra-deepwater* -- a water depth that is equal to or greater than 1,500 meters.
- *Ultra-deepwater architecture* -- the integration of technologies for the exploration for, or production of, natural gas or other petroleum resources located at UDW depths.

- *Ultra-deepwater technology* -- a discrete technology that is specially suited to address one or more challenges associated with the exploration for, or production of, natural gas or other petroleum resources located at UDW depths.

B. Goals

The goals of the UDW program element are to increase the size of the UDW resource base and to convert currently identified (discovered) resources into economic recoverable (proven) reserves while protecting the environment, thereby providing the U.S. consumer with secure and affordable petroleum supplies. These goals will be achieved by:

1. Reducing the costs to find, develop, and produce such resources,
2. Increasing the efficiency of exploration for such resources,
3. Increasing production efficiency and ultimate recovery of such resources,
4. Improving safety, and
5. Improving environmental performance, by minimizing any environmental impacts associated with UDW exploration and production.

This goal has been quantified through two targets described in Table 2.1. These targets are to be achieved within the 2007-2017 time frame.

Goal	Target Metric
Increase the size of the UDW resource base through new technology development and dissemination.	The 2000 MMS Assessment indicated that more than 50 billion recoverable barrels oil equivalent (BOE) remains to be discovered. The goal over the course of the program is to develop the technologies required to help identify and discover 2% or more (2% is the equivalent of two 500 MMBOE fields or ten 100 MMBOE fields) of this potential. At current commodity prices this goal would be valued in excess of $60 billion. Achievement of this goal would mean over a 400:1 return on investment.
Convert currently identified (discovered) resources into economic recoverable (proven) reserves	The MMS 2006-022 Report identifies a gap of 9 BBOE between proven reserves and the discovered resource base (Figure 2.1). The program goal is to add 100 MMBOE or more to the technically recoverable resource. At current commodity prices this goal would be valued in excess of $6 billion, roughly a more than 40:1 return on Program investment (additive to the target metric above).

Table 2.1: Goals and Target Metrics for the UDW Program

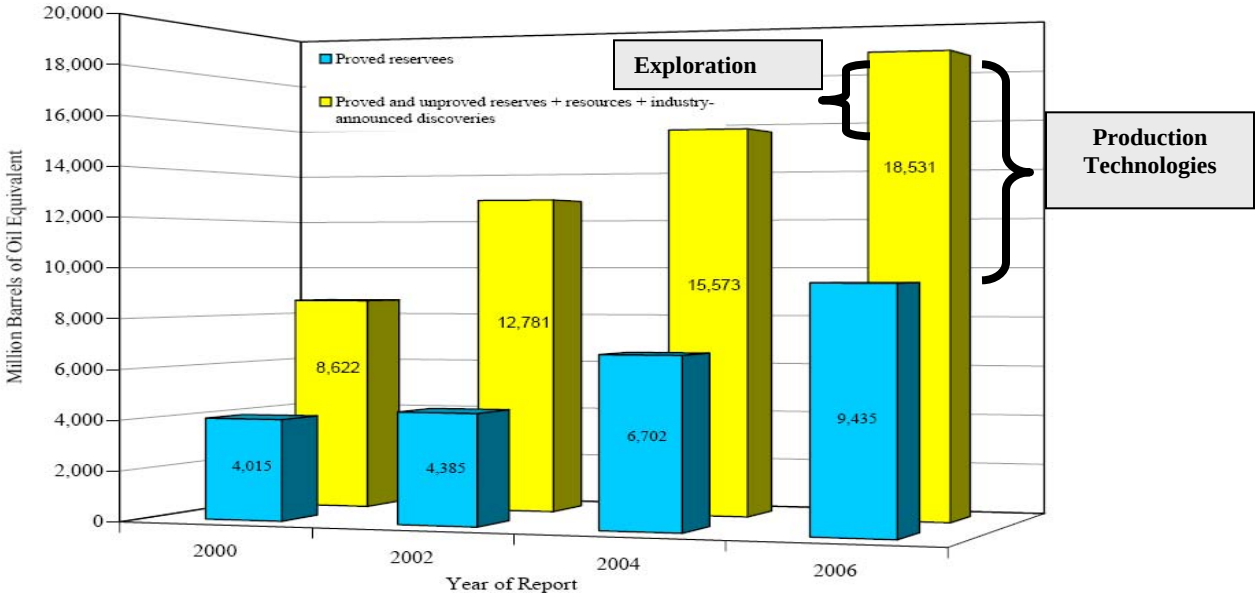


Figure 2.1: Illustration of increases in proved reserves and discovered volumes of deepwater hydrocarbons since 2000 (MMS 2006-022 Report, Figure 78). Exploration technologies have resulted in 3 BBOE additional resource between 2004 and 2006, while the target for new production technologies designed to move discovered resource to proven reserves, has grown to 9 BBOE.

C. Objectives

To meet the goals of converting the UDW resource base to economically recoverable reserves, new planning and analytical models must be built; new equipment must be designed and manufactured; and the equipment must then be demonstrated to be dependable and reliable, and ultimately manufactured and deployed in commercial quantities. This will be achieved by meeting the following near term, mid term, and long term objectives.

Near-Term (2008-2010)

Objective #1: *Technology Needs Assessment* – Complete the ongoing process to identify and prioritize the specific technologies that carry the greatest potential for adding to the UDW reserve base and report results and conclusions. During this process, take special care to identify and highlight for special attention those transformational technologies which crosscut a variety of field types and technology themes and, if successfully developed, are capable of "leapfrogging" over conventional pathways and dramatically advancing the ability of the industry to achieve the goals outlined above (i.e., Grand Challenges).

Objective #2: *Cost-Share Development* – Network with academia, industry, capital markets, and other key stakeholders to identify and capture cost-share funding for development of new technologies and report recommendations.

Objective #3: *Ultra-Deepwater Technology Development* – Design and administer multiple solicitations for R&D contracts designed to meet the stated goal of the UDW program element. Administer a selection process that results in a portfolio of R&D contracts that will best achieve that goal. Given the limited amount of funding, pay special attention to the selection of only those projects that are deemed most likely to result in significant increases in value through cost reduction, efficiency improvement, and effectiveness.

Mid-Term (2009-2012)

Objective #4: *Ultra-Deepwater Technology Development and Deployment* – Through assessment of R&D results and additional solicitations (as needed), continue the development and maturation of the most promising technologies identified during the first set of solicitations. Maintain a strong focus on deployment and commercialization. Terminate weaker prospects and focus budget and efforts on those technologies that carry the greatest potential for meeting the UDW program element goal.

Objective #5: *Environmental Technology Development and Deployment* – Work with appropriate regulatory agencies, academia, industry and other key stakeholders to identify strategies to improve environmental performance during deepwater development, and develop and administer solicitations for contracts to develop technologies that can achieve this improvement.

Objective #6: *Safety Technology Development and Deployment* – Work with appropriate regulatory agencies, academia, industry and other key stakeholders to identify strategies to improve safety performance during deepwater development, and develop and administer solicitations for contracts to develop technologies that can achieve this improvement.

Long-Term (2012-2017)

Objective #7: *Technology Demonstration* – Work with industry, appropriate regulatory agencies, and other key stakeholders to provide seed-level funding and other incentives for demonstration and validation of newly developed technologies.

Objective #8: *Technology Commercialization* – Work with industry, appropriate regulatory agencies, and other key stakeholders to provide seed-level funding and other incentives for commercialization of emerging technologies.

A crosscutting objective of each element of the program is technology transfer. While only 2.5% of the amount of each contract is specifically set aside for funding technology transfer, the entire program will be planned and executed with the knowledge that the desired impact will not be achieved without significant transfer of technology beyond the direct participants in funded projects. Projects will be scoped and funded to ensure that

the necessary materials are developed to support the required technology transfer activities and that the necessary participants have the support to fully participate in technology transfer events. In order to obtain the greatest leverage for technology transfer funds, RPSEA will make maximum use of existing technology transfer networks and organizations. Section 2.6 describes the plan for development of a technology transfer program in more detail.

D. Implementation Plan

The UDW program element will be implemented in a different manner than the other two parts of the consortium-administered program (Unconventional Resources and Small Producer elements) which focus on broader research topics. EPAct states the UDW program element "*shall focus on the development and demonstration of individual exploration and production technologies as well as integrated systems technologies including new architectures for production in ultra-deepwater."* RPSEA has subcontracted management of the UDW program element to a third party, which already has a successful process developed and operating. The following section outlines the major steps in the implementation plan.

DeepStar and Advisory Committee Roles in UDW Program Element

The UDW Program Element is being managed by the Chevron administered DeepStar Consortium through a subcontract with RPSEA. DeepStar is the world's largest UDW stakeholders group and has a 16 year history of managing collaborative research. Through this arrangement, the UDW program will have access to 700+ technical and management committee volunteers as well as a successful process for technology research, development, and commercialization. In addition to providing high level input from oil and gas operating companies that are ultimately responsible for the production of deepwater energy resources, this highly developed process formally facilitates the direct input of universities, regulatory bodies and other key stake holder groups. This process of broad engagement through expansive and inclusive advisory committees will provide the UDW Program with significant *pro bono* expertise as well as potentially significant matching funds to further accelerate the development of UDW technologies.

DeepStar will be assisted in carrying out its subcontract by the UDW Program Advisory Committee (PAC) and nine Technical Advisory Committees (TACs) (see Appendix B for committee membership). The UDW PAC members represent asset owners that are currently operating in the UDW Gulf of Mexico. The UDW PAC provides high level input on program priorities, field areas of interest, and technology dissemination, as well as a link to the producer and research communities, but its primary role is project selection. PAC engagement in the process is critical as these operators will be the organizations called upon to actually deploy and operate the new technologies developed under the program.

Supporting the PAC are nine TACs, each of which is focused on a particular UDW technology area (see Table 2.2). The role of the TACs, with representation from Subject Matter Experts who study and apply UDW technologies in real field situations, is to

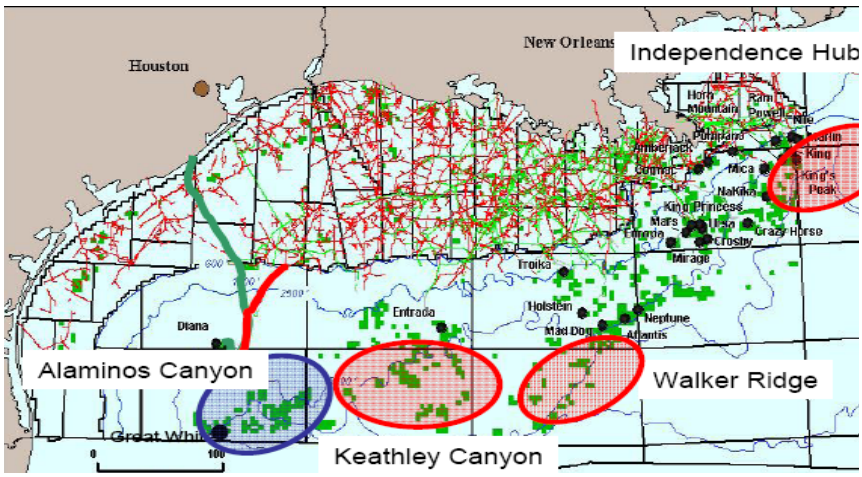
identify current technology gaps and define the specific R&D efforts needed to address these gaps. As such, the TACs provide a bottom-up end-user-driven program.

Drilling & Completion	Environmental, Safety & Regulatory	Floating Facilities
Flow Assurance	Geo-Science	Met-Ocean
Reservoir	Subsea Facilities	System Engineering & Architecture

Table 2.2: UDW Technical Advisory Committees

Identification of Focus Areas for New Technology Development

In developing the list of focus areas for solicitations, DeepStar performed a systems engineering study based on industry UDW experience and needs. Four base case field development scenarios were identified as representative of future Gulf of Mexico UDW developments with technical barriers which challenge development. These scenarios are drawn from four key areas of activity in the deepwater Gulf of Mexico (Walker Ridge, Keathley Canyon, Alaminos Canyon and the Eastern Gulf), and the associated technology challenges (Figure 2.2). Four generic fields were created (Canopy, Gumout, Coyote, and Diablo) based upon the areas of current activity. Each of the generic fields is characterized by a unique design feature currently hindering technical and economic development (Table 2.3). The field development scenarios will be further matured into design bases and will be used as input for the UDW Program Element activities. The systems engineering study will be revisited periodically over the duration of the UDW Program to ensure relevance with ongoing industry exploration and development activities.



Walker Ridge / Keathley Canyon
- sub-salt
- deeper wells
- tight formations

Alaminos Canyon
- viscous crude
- lacking infrastructure

Eastern Gulf – Gas Independence Hub
- higher pressure & temp.
- CO_2 / H_2S

Overall
- higher drilling costs
- challenging economics

Figure 2.2: Technical challenges for identified basins

Field Type	Technology Challenge	Development Options
Canopy Field	Low Permeability Reservoir	Semi with Wet Trees
		FPSO with Wet Trees
		FPSO EPS
		Produce to Beach
Gumout Field	High Viscosity Oil	Dry Tree Structure
		Satellite Tieback to Host
Coyote Field	Small Reserve Fields	Satellite Tieback to Host
Diablo Field	XHPHT (22.5 ksi x 350+^{o}F)	Semi w/ Gas Sweetening
		Produce to Beach thru Sour Gas Pipeline

Table 2.3: UDW Base Case Scenarios

Prioritization of Technology Development Needs

The nine TACs provided systems engineering input by reviewing the four base case scenarios and identifying the highest priority technology "themes" required to bridge the technology challenges and remove barriers to development. Identified themes are listed in Table 2.4a. A number of the themes identified are either multi-disciplinary or cut across several TAC discipline areas. Accordingly, the themes have been categorized either by specific base case or as crosscutting.

The UDW TACs further refined the 33 themes into specific project ideas which address one or multiple themes. The process included the development of more than 100 project ideas, which were proposed by the TACs themselves or by any interested/knowledgeable entity involved in the process. All project ideas were compiled and reviewed by each TAC, which then refined and combined similar ideas, refined the Scope of Work, identified deliverables, and estimated the schedule and costs. Each TAC ranked the resulting respective list of project ideas and submitted the highest ranking project ideas to the PAC. The PAC evaluated and prioritized the projects from all TACs. The PAC prioritization was based upon projected project impact, available budget, and alignment with overall Program Goals. The prioritization process used by the PAC called for each of the eleven UDW Operating Companies in the PAC to select project ideas (up to a total of $36 million) which, from their company's perspective, would do the most to bridge technology gaps of particular relevance to their operations and meet the goals of the RPSEA UDW Program. Only those project ideas receiving a majority vote (6 of 11 companies) were considered.

Selected project ideas are listed in Tables 2.4b and 2.4c for Year 1 (2007) and Year 2 (2008) solicitations. These projects are categorized as addressing one of four major and

one minor development and operation challenges currently pursued by the worldwide UDW community. These are:

1. Significantly extend subsea tieback distances / surface host elimination;
2. Enable dry trees and risers in 10,000 foot water depths;
3. Cost effective subsea intervention;
4. Continuous Improvement
    a. Per wellbore recovery
    b. Cost reduction; and
5. Technology facilitation

Development of Solicitations

Each of the top-ranked proposed project ideas listed in Tables 2.4b and 2.4c has been converted by RPSEA into a Request for Proposal (RFP). Each RFP has been or will be released as a separate solicitation. The first four UDW solicitations for Year 1 (2007) were released on November 5, 2007, and additional solicitations were released periodically, working toward the goal of having all 2007 RFPs issued. The solicitations were released on the RPSEA website with links provided on the NETL and Fossil Energy websites. Each solicitation was open for a minimum period of 45 days (see Section 2.4 for further details on the solicitation process).

Field Type / Focus Areas	Technology Challenge	Themes
Canopy Field	**Low permeability reservoir**	1. Completion of long reservoir sections. 2. Deep reservoir stimulation technology. 3. Formation Integrity at Commercial Production Conditions (fluid rates, differential pressures).
Gumout Field	**High Viscosity Oil**	4. Intervention strategies and well architecture for downhole equipment maintenance (e.g., pumps). 5. Viscous Oil Production Technology.
Coyote Field	**Small Reserve Fields**	6. Drilling with small margin between overburden and fracture pressure (dual density drilling is a potential solution for this issue).
Diablo Field	**XHPHT (22.5 ksi & 350+^{o}F) Sour service**	7. Materials Sciences for UDW Risers and Moorings, tubulars, tools, instrumentation, and completion equipment. 8. HPHT Flow Assurance Technologies. 9. HPHT Formation Evaluation.
Crosscutting	**Environmental**	10. Safety Barrier Testing and Validation Criteria. 11. Environmental and Regulatory Impact of Emerging Technologies. 12. Deepwater Produced Water Management.
	Floating Facilities	13. Optimized UDW Field Development Concepts for Improved Economics. 14. Improved Design and Analysis Methods. 15. Mooring and Riser Integrity Management.
	Flow Assurance	16. Organic, Inorganic and Solids Management.
	Geo-Science	17. Subsalt Imaging & Geo-mechanics. 18. Reservoir & Fluid Characterization. 19. Economics.
	Met-ocean	20. Effect of changing weather patterns on hurricane severity. 21. Operational 3-D current forecast model capable of simulating the Loop/eddies. 22. Modeling for strong near-bottom currents along the Sigsbee Escarpment.
	Reservoir	23. Appraisal. 24. Field development. 25. Production and Reservoir Surveillance.
	Subsea Facilities	26. Subsea Production Equipment Enhancements. 27. Mature Subsea Processing Technology. 28. Pipeline, Flowline and Umbilical Technology. 29. Subsea Well Intervention Tech. improvement.
	Systems Engineering and Architecture	30. Design Criteria for the Base Cases. 31. System impact of proposed technologies on the field development scenarios. 32. Grand Challenge projects. 33. Small Business Initiatives.

Table 2.4a: UDW Program Element Technology Themes

Project Number	Project Description	Applicable Themes (see Table 2.4a)
Extend subsea tieback distances / surface host elimination		
DW1301	Multiphase Meter Technology : Improvements to Deepwater Subsea Measurement	11, 12, 16, 24, 25, 26, 28
DW1302	Ultra-high Conductivity Umbilicals	26, 28, 31
DW1901	Subsea Processing System Integration Engineering	5, 11, 12, 26, 27, 28, 30, 31
DW1201	Wax Control	5, 16
DW1902	Deep Sea Hybrid Power System	11, 26, 27, 28, 29, 31
DW1501	Extreme Reach Development	31, 32
Enable dry trees and risers in 10,000' water depths		
DW1401	Carbon Fiber Wrapped High Pressure Drilling and Production Riser Qualification Program	7, 11, 13, 15, 31
DW1402	Ultra-deepwater Dry Tree System for Drilling and Production in GOM	13, 24, 31
DW1403	Fatigue Performance of High Strength Riser Materials	7, 15, 28
Cost effective subsea intervention		
DW1502	Coil Tubing Drilling and Intervention System Using Cost Effective Vessels	2, 4, 5, 11, 23, 24, 25, 29, 31
Continuous Improvement		
DW1701	Improved Recovery	2, 3, 18, 19, 23, 24, 25, 31
DW2001	Synthetic benchmark models of complex salt	17
DW1801	Effect of Global Warming on Hurricane Activity	11, 20
Technology Facilitation		
DW1603	Graduate Student Design Projects	30, 31
DW1604	Small Business Initiative	33

Table 2.4b: UDW Program Element Solicitation Topics (2007)

Project Number	Project Description	Applicable Themes (see Table 2.4a)
Extend subsea tieback distances / surface host elimination		
DW2901	Reliable deepwater power distribution & components (Component Qualification - performed in steps.)	26, 27, 28, 31
DW1202	EOS improvement for xHPHT	8, 9, 18, 23, 25
DW2201	Viscous Oil PVT	2, 5, 16, 18
Cost effective subsea intervention		
DW2301	Deepwater Riserless Light Well Intervention	2, 4, 11, 23, 24, 25, 29, 31
DW2501	Early Reservoir Appraisal, Utilizing a Low Cost Well Testing System - Phase 1	9, 11, 13, 18, 23, 24, 25, 31
Continuous Improvement		
DW2701	Resources to Reserves Development and Acceleration through Appraisal	9, 18, 23, 24, 25, 31
DW2502	Modeling and Simulation of Managed Pressure Drilling for Improved Design, Risk Assessment, Training and Operations	6, 11, 31
DW2101	New Safety Barrier Testing Methods	10, 11
DW2801	Gulf 3-D Operational Current Model Pilot	21, 22

Table 2.4c: UDW Program Element Solicitation Topics (2008)

Funds Available and Anticipated Awards

The UDW Program will have $14.96 million per year available for project awards. It is anticipated that the UDW Program Element will award 5-15 projects ranging from $250K to $3 MM having an average Federal government contribution of $750K and a project period of 1-3 years, with the funding from the first (2007) year. Approximately 5-9 projects are anticipated to be awarded with the funding from Year 2 (2008).

E. Metrics

The goals of the UDW program element are to increase the size of the UDW resource base and to convert currently identified (discovered) resources into economic recoverable reserves while protecting the environment, thereby providing the U.S. consumer with secure and affordable petroleum supplies. The long term metrics for this program element and the Consortium in general are discussed in Section 2.5.

Shorter-term metrics include the completion of annual milestones that show progress towards meeting the program element objectives. As a minimum, short term metrics through FY 2008 shall include:

- Prioritize proposed projects.
- Issue 15-24 solicitations.
- Select and award a minimum of 10 projects.
- Establish FY 2009 R&D priorities based on results of 2007-08 solicitations and inputs from the TACs, PAC and UDAC.

In addition, the UDW Program will continue to acquire and analyze the data necessary to accurately quantify base case and post technology application case assessments of proved and unproved reserves in order to accurately quantify the incremental reserves attributable to specific program-developed technologies. These assessments will include estimates of the value of goods and services created from the products developed by this program element. In addition, the program will continue to acquire data to validate/calibrate the MMS Assessment of remaining discoverable, recoverable resources. Determination of the UDW program benefits will be fully coordinated with NETL's Office of Systems, Analysis, and Planning.

F. Milestones

The first solicitations for 2008 will be released after approval and posting of the 2008 Annual Plan, and will remain open for a minimum of 45 days. The review, selection and award process will take approximately two and one half months. Each approved project idea will be released as a separate solicitation. The solicitations will be released in groups of 3-4 solicitations, with all solicitations released within 6 months of plan approval.

The steps for developing, releasing, reviewing and selecting projects are listed below:

1. Project Development and Prioritization (completed)
2. DAP Submittal (completed)
3. Annual Plan Modification (as warranted)
4. Annual Plan Approval
5. Develop Solicitation Packages
6. Obtain DOE Approval of Solicitation
7. Solicitations 1-4
    a. Solicitation Open Period
    b. Proposal Evaluation and Selection
    c. DOE Approval of Selections
    d. Contract Award
8. Solicitations 5-7
    a. Solicitation Open Period
    b. Proposal Evaluation and Selection
    c. DOE Approval of Selections
    d. Contract Award

9. Solicitations 8-9
    a. Solicitation Open Period
    b. Proposal Evaluation and Selection
    c. DOE Approval of Selections
    d. Contract Award
10. Develop and apply methodology for quantifying benefits as a result of the application of program-developed enabling technologies.
11. Establish FY2009 R&D priorities based on results of 2007-08 solicitations, inputs from the program advisory committees, and modeling of the impacts of various R&D applications.
12. Actively manage all awards and make any necessary adjustments to research plans.
13. Satisfactorily report all program deliverables to NETL.

G. Ongoing Activities

As of December 1, 2007, RPSEA has released nine UDW solicitations. The solicitations released were DW1301, DW1401, DW1402, DW1403, DW1501, DW1603, DW1701, DW1801, DW1902, and DW2001 (see Table 2.4b for project titles). The selected offeror for each solicitation will be included in the final version of the 2008 Annual Plan as allowed by schedules. This information will be provided to the Ultra-Deepwater Advisory Committee as the information becomes available.

2.2 Unconventional Natural Gas and Other Petroleum Resources Program Element

A. Mission

The mission of the Unconventional Resources Element of the consortium-administered R&D program is to identify and develop economically viable technologies to locate, characterize and produce unconventional natural gas and other petroleum resources, in an environmentally acceptable manner.

"Unconventional natural gas and other petroleum resource" is defined in Section 999G of EPAct as *natural gas and other petroleum resource[s] located onshore in an economically inaccessible geological formation, including resources of small producers.*

B. Goal

The overall goal of the Unconventional Resources Program Element is to increase the supply of domestic natural gas and other petroleum resources through the development, demonstration, and commercialization of technologies that reduce the cost and increase the efficiency of exploration for and production of such resources, while improving safety and minimizing environmental impact.

The contribution of natural gas to the Nation's gas supply from three specific unconventional resources—gas shales, coal seams, and tight sands—has grown significantly during the past 20 years. These resources have been highlighted by the Energy Information Administration (EIA) and others as critical supply sources during the next 20 years. According to the latest estimate by the National Petroleum Council (NPC 2003) the volume of technically recoverable gas from these three resources in the lower 48 states is in excess of 293 trillion cubic feet (TCF). Due to their potential and important significance, and in view of the limited resources available to the research program, gas shales, tight gas sands, and coalbed methane were determined to be the unconventional resources to be specifically addressed in the initial years of the program. Opportunities to leverage developed technologies through application to other unconventional natural gas and petroleum resources will be sought, and other petroleum resources may be specifically targeted in subsequent years. Oil shale and unconventional oil resources are addressed by the EPAct 2005 Section 999 complementary R&D program and the traditional R&D program, both managed by NETL.

In order for the program to be successful by maximizing the value of natural gas and other petroleum resources of the United States through new technology, the transfer of that technology to companies operating in the targeted resources will need to be an integral part of the program planning and execution. Additionally, any development of new resources must be accomplished in an environmentally acceptable manner, so it will be important that technologies developed under the program be applied in ways that minimize the impact of resource development on natural and cultural resources.

This goal has been quantified through two targets described in Table 2.6. These targets are to be achieved within the 2008-2017 timeframe and will include interim targets.

Goal	Target Metric
Through new technology development and dissemination, increase the size of the technically recoverable unconventional resource base.	The NPC 2003 technically recoverable unconventional resource base is currently 293 TCF. This number, as with the overall resource base, has grown in magnitude in past years due to new technology applications. A goal of the program is to add 30 TCF to the technically recoverable unconventional resource base.
Convert technically recoverable resources into economic recoverable (proven) reserves	The technically recoverable unconventional resource base is currently 293 TCF. Recovery of this resource is not currently economic, but can be made so through the development and application of new technology that drives down the cost and environmental impact of development of this reserve base. A goal of this program is to convert 10 TCF of unconventional gas resource from technically recoverable to economic recoverable reserves. It should be noted that both of these target metrics are closely related in how they will be achieved and are additive.

Table 2.6: Goals and Target Metrics for the Unconventional Gas and Other Petroleum Resources Program

C. Objectives

Objectives for the Unconventional Resources Program Element have been developed with input from the Consortium's unconventional onshore Program Advisory Committee (PAC). This input has been combined with information gathered during a number of relatively recent efforts to identify and prioritize the technology challenges to development of unconventional resources. These efforts include: (1) a series of five workshops held in various producing basins by RPSEA and New Mexico Tech during 2003, (2) workshops carried out as part of the NPC 2003 Natural Gas Study, (3) a series of DOE-sponsored unconventional gas technology road-mapping workshops held during 2005, (4) eleven forums held by RPSEA during late 2006 and early 2007, and (5) information developed for the NPC Global Oil and Gas Study in 2006 and 2007. All of these inputs were combined to arrive at the prioritized list of technology challenges that underlie both the objectives of this Program Element and the list of solicitation topics found in the implementation plan.

The objectives are defined in terms of the resource (shales, coal, tight sands), and the level of field development category (existing, emerging and frontier). All three resources are important but gas shales, the most difficult and least developed, was identified during this process as the top priority. It was the consensus of the advisory groups that gas shales promised the greatest potential return on investment in terms of reserves additions. The three development categories are:

- Existing - Active development drilling and production.
- Emerging - Formations, depth intervals, or geographic areas from which there has been limited commercial development activity and very large areas remain undeveloped.
- Frontier Area - Formations, depth intervals, or geographic areas from which there has been no prior commercial development.

The relative balance of the program's focus among these three categories, as well as the priority basins identified within each of the three resource areas, are illustrated within Table 2.7. The basins noted are representative based on expressed industry interest and not meant to exclude opportunities in other basins within the three resource types.

Level of Field Development	Program Balance	Priority Gas Shales	Priority Coalbed Methane	Priority Tight Sands
Existing	45%	Ft Worth - Barnett	Appalachian	Green River/Uinta
		Appalachian	San Juan	South Texas
			Powder River	Appalachian
Emerging	45%	Permian	Uinta-Piceance	Appalachian
		Arkoma/Ardmore/Anadarko	Powder River	Piceance
		Illinois & Michigan		Uinta
Frontier Area	10%	Permian-Woodford	Illinois & Michigan	Western Oregon
		Green River	N. Mid-continent	Washington

Table 2.7: Resource Prioritization Matrix

In the near-term, the primary challenge facing gas producers is the rapid depletion rate of new wells and their relatively high cost. Rapid decline rates require that many new wells be drilled just to maintain production. To address these concerns, R&D activities associated with the near term will have a significant field-based component with supporting analytic work. Methods and techniques developed in this phase will be tested in the field through industry cooperative field work. This near-term research and development will be built on recent technology successes in advancing these technologies to a higher level and broadly disseminating the results. Near term projects will primarily focus on field testing, technology dissemination and commercialization.

In the mid-term, program emphasis again will be placed on industry cooperative field work in emerging areas. Working models developed through the near term program will be applied in less developed fields, modified as required, and documented to make the technology readily available to the industry. The focus of the mid-term research will be

the development of at least one new emerging resource area to the point where a substantial portion of the technical resource becomes economic reserves.

In the long-term, the program aims at identification and characterization of two or more resource-rich plays or basins with limited current activity. The objective will be to provide information, knowledge, and methodologies to spur activity in currently undeveloped and low activity resources, thereby allowing access to gas that is technically not feasible to drill and produce with current technologies.

Specifically, the objectives of the Unconventional Resources Program Element are:

Near term (2008-2010)
Objective 1: Develop tools, techniques, and methods that substantially increase, in an environmentally sound manner, commercial production and ultimate recovery from high priority existing and emerging established gas shale formations.

Objective 2: Develop tools, techniques, and methods that substantially decrease the environmental impact of produced and used water associated with coalbed methane and gas shale development. And secondarily, develop tools, techniques, and methods to improve production from coalbed methane reservoirs within high priority existing and emerging plays.

Objective 3: Develop tools, techniques, and methods that increase commercial production and ultimate recovery from established tight gas sand formations and accelerate development of existing, and emerging tight gas sands plays.

Mid-Term (2009-2012)
Objective 4: Develop techniques and methods for exploration and production from high priority emerging gas shale, coal, and tight sand plays where these operations have been hindered by technical, economic, or environmental challenges.

Long-Term (2012-2017)
Objective 5: Develop techniques and methods for exploration and production from frontier area basins and formations where these operations have been hindered by technical, economic, or environmental challenges.

Development of an Integrated Program
An important aspect of this program element is encouragement of teaming efforts to address integrated production needs of a particular unconventional gas resource. To the extent possible, integration of geologic concepts with engineering principles to overcome production and environmental issues is encouraged. The intent is to develop a coordinated program as opposed to individual projects such that the whole has much greater value than the sum of the parts.

A crosscutting objective of each element of the program is technology transfer. While only 2.5% of the amount of each contract is specifically set aside for funding technology transfer, the entire program will be planned and executed with the knowledge that the

desired impact will not be achieved without significant transfer of technology beyond the direct participants in funded projects. Projects will be scoped and funded to ensure that the necessary materials are developed to support the required technology transfer activities and that the necessary participants have the support to fully participate in technology transfer events. In order to obtain the greatest leverage for technology transfer funds, RPSEA will make maximum use of existing technology transfer networks and organizations. Section 2.6 describes the plan for development of a technology transfer program in more detail.

D. Implementation Plan

The Unconventional Resource Program Element is being implemented by developing and administering solicitations for R&D projects in areas that address the objectives outlined above. The following section outlines the major steps in the implementation plan.

Development of Solicitations to Address Prioritized Technology Challenges

Early solicitations have been broad in scope, in order to allow consideration of a broad range of research topics addressing key issues. The Scope for each of the areas of interest for the initial planned solicitation is summarized below. A more complete description of the solicitation process is included in Section 2.4 of this report. As the program matures, subsequent solicitations will build on earlier program successes and will address more detailed and specific problems.

Area of Interest 1: Gas Shales

Scope: The solicitation requests ideas and projects for development of tools, techniques, and methods that may be applied to substantially increase, in an environmentally sound manner, commercial production and ultimate recovery from the established gas shale formations and accelerate development of gas from emerging and frontier gas shale plays. The concepts may include but are not limited to the following areas:

- Characterization of geologic, geochemical, geophysical, and operational parameters that differentiate high performing wells.
- Comprehensive characterization of the geological, geochemical and geophysical framework of gas shale resource plays, particularly emerging plays.
- Development of methods to accurately assess the potential of shale for gas production from common industry petrophysical measurements.
- Development of methods to plan, model, and predict the results of gas production operations.
- Accurate delineation of the natural fracture system for guiding horizontal wells to intersect a large number of open fractures.
- Development of extra-extended single and multi-lateral drilling techniques.
- Development of steerable hydraulic fractures.

- Development of suitable low-cost fracturing fluids and proppants; e.g., non-damaging fluids and/or high strength low density proppants.
- Develop advanced drilling, completion, and/or stimulation methods that allow a greater volume of reservoir to be accessed from a single surface location; and decrease the environmental impact.
- Develop stimulation methods that require less water and other fluids to be injected into the subsurface.
- Develop stimulation methods that result in a lower volume of treatment fluids produced to the surface.
- Develop approaches for improved treatment, handling, re-use, and disposal of fluids produced and/or used in field operations.
- Extending the commercial life of a producing well through reduction of the initial drilling and completion costs, elimination of workovers and recompletions, as well as reduction of production costs, particularly those associated with water disposal and management.
- Conduct preliminary studies of novel concepts for unconventional gas development in gas shale resources, and for the initial assessment of the potential of frontier gas shale resources.

Area of Interest 2: Water Management Associated with Coalbed Methane and Gas Shale Production

Scope: The solicitation requests proposals for development of tools, techniques, and methods that may be applied to substantially decrease the environmental impact of produced and used water associated with coalbed methane and gas shale development. The concepts may include but are not limited to the following areas:

- Develop methods for the treatment of produced water.
- Develop methods for sustainable beneficial use of produced water.
- Develop methods to control fines production.
- Develop techniques to minimize the volume of water produced to the surface.
- Develop water management methods to reduce drilling and completion costs
- Develop technologies for effective development of multiple thin bed coal seams.
- Conduct preliminary studies of novel concepts for unconventional gas development in coalbed methane resources, and for the initial assessment of the potential of frontier coalbed methane resources.

Area of Interest 3: Tight Sands

Scope: The solicitation requests proposals for development of tools, techniques, and methods to increase commercial production and ultimate recovery from established tight

gas sand formations, and accelerate development of emerging and frontier tight gas plays. The concepts may include but are not limited to the following areas:

- Characterization of geologic, geochemical, geophysical, and operational parameters that differentiate high performing wells.
- Comprehensive characterization of the geological, geochemical and geophysical framework of tight sand resource plays, particularly emerging plays.
- Accurate delineation of the natural fracture system for guiding horizontal wells to intersect a large number of open fractures.
- Development of extra-extended single and multi-lateral drilling techniques.
- Development of steerable hydraulic fractures.
- Development of suitable low-cost fracturing fluids and proppants; e.g., non-damaging fluids and/or high strength low density proppants.
- Develop advanced drilling, completion and/or stimulation methods that allow a greater volume of reservoir to be accessed from a single surface location and decrease the environmental impact.
- Development of efficient and safe water management schemes.
- Extending the commercial life of a producing well through reduction of the initial drilling and completion costs, elimination of workovers and recompletions, as well as reduction of production costs, particularly those associated with water disposal and management.
- Conduct preliminary studies of novel concepts for unconventional gas development in tight sands, and for the initial assessment of the potential of frontier tight sand resources.

Establishment of Technical Advisory Committees

An important part of this process involves input from a number of Technical Advisory Committees (TACs) that have been established to help review and evaluate proposals from those submitted in response to the solicitations. The TACs will also play a role in helping to refine subsequent solicitations.

These TACs will conduct their work and continue as long as needed. As the program changes and projects are completed, individual TACs will be closed as new ones are established based on program need. A number of potential TAC topics have been identified and individual experts have expressed their interest in serving on these committees. To a certain degree, the mix of proposals received will determine whether discipline-oriented groups, interdisciplinary problem-focused groups, or some combination will be required.

Funds Available and Anticipated Awards

It is anticipated that there will be $13.89 million available for funding the Unconventional Resources Program Element during each fiscal year. Approximately 5 to 15 awards are anticipated to be awarded annually. If the quantity and quality of the proposals allows, subsequent solicitations in the out years will award a larger number of projects with the understanding that portions of their funding will come from out year funds (i.e., "mortgaged" projects).

The typical award is expected to have duration of one to three years, although shorter or longer awards may be considered, if warranted by the nature of the proposed project.

E. Metrics

The overall goal of the Unconventional Resources Program Element is to increase the supply of domestic natural gas and other petroleum resources. The long term metrics for this program element and the Consortium in general are discussed in Section 2.5.

Short term metrics include the completion of annual milestones that show progress toward meeting the program element objectives. As a minimum, short term metrics through FY2008 shall include:

- Successfully issue and complete at least two solicitations.
- Engage technical advisory committees to review solicitations that reflect sufficient breadth and depth of industry experience to ensure a portfolio of high-quality projects.
- Select and award a minimum of 10 projects.
- Establish FY2009 R&D priorities based on results of 2007-08 solicitations and other inputs from the program advisory committees, and modeling the impacts of various R&D applications.

In addition, RPSEA will acquire and analyze the data necessary to accurately quantify base case and post technology application case assessments of technically recoverable and economically recoverable reserves, as discussed in Section 2.5. Determination of the Unconventional Resources program benefits will be fully coordinated with NETL's Office of Systems, Analysis, and Planning.

F. Milestones

The first solicitation for 2008 will be released after approval and posting of the 2008 Annual Plan, and will remain open for a minimum of 45 days. The review, selection and award process will take approximately than two and one half months. Under the Stage/Gate approach described in Section 2.5, all projects will be fully funded to the completion of the appropriate decision point identified in each contract, which may include multiple stages. Once a decision is made to move to the next stage or decision point, additional funding will be provided from available funds.

The steps for developing, releasing, reviewing and selecting projects are listed below:

1. Submit Draft Annual Plan (completed).
2. Issue Solicitation 1 (Gas Shale, Water Management, Tight Sands focus).
3. Establish and engage Technical Advisory Committees to review solicitations (completed).
4. Administer selection and award of highest quality projects based on Solicitation 1 submissions.
5. Issue Solicitation 2.
6. Establish technical advisory committees to review solicitations.
7. Administer selection and award of highest quality projects based on Solicitation 2 submissions.
8. Develop and apply methodology for quantifying benefits as a result of the application of program-developed enabling technologies.
9. Establish FY2009 R&D priorities based on results of 2007-08 solicitations, inputs from the program advisory committees and URTAC, and modeling of the impacts of various R&D applications.
10. Monitor progress of all awards and make any necessary adjustments to research plans.
11. Conduct Technology Transfer workshops at the program level.
12. Satisfactorily report all program deliverables to NETL.

G. Ongoing Activities

The 2007 solicitation concentrated on three areas of interest in existing and emerging areas: Gas Shales, Water Management in Coalbed Methane and Gas Shales, and Tight Sands. Proposals in the frontier area received consideration for selection if a compelling impact was demonstrated; however those were not the main focus. The selections will be dependent on the quality of proposals received. Subsequent 2008 solicitations will be designed to fill in the gaps that the 2007 solicitation left open. As the R&D program gets underway in a particular region or resource area, RPSEA anticipates that R&D issues not initially identified may develop, thereby resulting in the need for additional solicitations.

There was $13.89 million available for the Unconventional Resources Program Element from 2007 funding. The first solicitation was released on October 17, 2007 and closed on December 3, 2007. The proposals were evaluated by the Technical Advisory Committees, RPSEA and NETL. Selections and awards are anticipated to be made in early February 2008. Approximately 5 to 15 awards are anticipated to be awarded and will be fully funded. The selected offerors will be included in the final version of the 2008 Annual Plan. This information will be provided to the Federal Advisory Committees as the information becomes available.

2.3 Small Producer Program Element

A. Mission

The mission of the Small Producer Program Element of the consortium-administered R&D program is to increase the supply from mature domestic natural gas and other petroleum resources through reducing the cost and increasing the efficiency of production of such resources, while improving safety and minimizing environmental impact, with a specific focus on the technology challenges of small producers.

"Small producer" is defined in EPAct as *an entity organized under the laws of the United States with production levels of less than 1,000 barrels per day of oil equivalent.*

B. Goal

The goal of the Small Producer Program Element is to ***add to the reserve base associated with mature fields operated by small producers*** by increasing the recovery factor, applying technology to make economically marginal resources economic and also to decrease the impact of development in environmentally sensitive areas. The target metric for this program element is to achieve a 10 to 1 return on R&D investment, in terms of the value of new reserves added in mature fields as a result of program-developed technologies. This target is to be achieved within the 2007-2017 timeframe.

C. Objectives

The small producer community is quick to adopt new technology that has been shown to have an economic benefit in their operating environment, but does not generally have the time or resources to provide a test bed for technology development efforts or the demonstration of new applications of existing technology. The small producer program element has a crucial role in ensuring that leading edge exploration and production technology is made available to small producers, allowing them to maximize their important contribution to the nation's secure energy supply.

The approach to enhancing the impact of small producers on energy production involves two related but distinct activities. First, individual small producers facing representative challenges will be engaged to work with technology providers on the development and application of technology to enhance economic and environmentally responsible production and resource recovery. The support provided through the program will mitigate the economic risk normally associated with the application of new technologies. Second, the information acquired as a result of projects funded through the program will serve as the basis for technology transfer efforts that will promote appropriate novel technology applications throughout the small producer community.

While only 2.5% of the amount of each contract is specifically set aside for funding technology transfer, the entire program will be planned and executed with the knowledge

that the desired impact will not be achieved without significant transfer of technology beyond the direct participants in funded projects. Projects will be scoped and funded to ensure that the necessary materials are developed to support the required technology transfer activities and that the necessary participants have the support to fully participate in technology transfer events. In order to obtain the greatest leverage for technology transfer funds, RPSEA will make maximum use of existing technology transfer networks and organizations. Section 2.6 describes the plan for development of a technology transfer program in more detail.

The specific objectives of the Small Producer Program Element are:

Near term (2008-2010)
Objective 1: Apply technologies in new ways to enable improvements in water management and optimization of water use in mature fields.

Objective 2: Apply technologies in new ways to improve oil and gas recovery from mature fields, extending their economic life.

Objective 3: Apply technologies in new ways to reduce field operating costs.

Mid term (2009-2012)
Objective 4: Apply lessons from all near-term projects to new basins/areas and develop new technologies to address the problems of Objectives 1-3.

Long term (2012-2017)
Objective 5: Apply lessons from near and mid-term projects, as well as new technologies from other program elements, to basins nationwide.

D. Implementation Plan

The Small Producer Program Element is being implemented by developing and administering solicitations for R&D projects in areas that address the objectives outlined above. The following section outlines the major steps in the implementation plan.

Small Producers Program Element Advisory Groups

The Small Producer Program receives guidance from a Small Producer Research Advisory Group (RAG) consisting of industry and academic representatives that are closely tied to the national small producer community (Appendix B). The RAG focuses on identifying, targeting, and prioritizing specific technology needs. This advisory group also provides a key communications focal point for encouraging the formation of the requisite research consortia (see Sec. 999B (d)(7)(C) of the text of Section 999 provided in Appendix A for a description of this requirement). After projects are initiated, the RAG follows each project's progress, plans, and results, with particular attention to tech transfer. All projects are reviewed by the RAG semi-annually.

While the RAG will be responsible for directing the Small Producer program, the Unconventional Onshore PAC will remain responsible for oversight of the entire onshore

program, which includes the Small Producer Program Element as well as the Unconventional Resources Program Element. The RAG will interact with the Unconventional Onshore PAC through the RPSEA Onshore VP and through its chairman who will hold a seat on the Unconventional Onshore PAC reserved for a representative of the Small Producer RAG.

While the Small Producer RAG is the body primarily responsible for the management of the selection process for awards under the Small Producer program, the RAG will continue to draw on the expertise of the specialized Unconventional Onshore TACs. These TACs will be available to provide in depth technical reviews on proposals to supplement the expertise of the RAG.

Development of a Solicitation to Address Prioritized Technology Challenges

The Small Producer Program Element has been able to draw on the input from the exercises and workshops listed in the Unconventional Resources section of this plan (see Section 2.2 part C) , as well as specific events aimed at small producers conducted by New Mexico Tech and West Virginia University. The overarching theme expressed by small producer representatives at these events was the need for technology which allows small producers to maximize the value of the assets they currently hold, primarily in mature fields.

Accordingly, the solicitation under this program element has been aimed toward developing and proving the application of technologies that will increase the value of mature fields by reducing operating costs, decreasing the cost and environmental impact of additional development, and improving oil and gas recovery. Reducing risk is seen as key to reducing costs and improving margins. Improved field management, best practices, and lower cost tools (including software) are all within the scope of this effort.

In order to ensure that technologies developed under this program are applied to increase production in a timely fashion, each proposal has been required to outline a path and timeline to an initial application. A specific target field for an initial test of the proposed development must be identified, and ideally the field operator will be a partner in the proposal.

In compliance with Section 999B(d)(7)(C) of EPAct, all awards resulting from this solicitation "shall be made to consortia consisting of small producers or organized primarily for the benefit of small producers." For the purposes of the solicitation, a consortium shall consist of two or more entities participating in a proposal through prime contractor-subcontractor or other formalized relationship that ensures joint participation in the execution of the scope of work associated with an award. The participation in the consortium of the producer that operates the asset that is identified as the initial target for the proposed work will be highly encouraged.

The 2008 solicitation will request proposals addressing the following technology challenges:

- Development of approaches and methods for water management, including produced water shutoff or minimization, treatment and disposal of produced water, fluid recovery, chemical treatments, and minimizing water use for drilling and stimulation operations.
- Development of methods for improving oil and gas recovery and/or extending the economic life of reservoirs.
- Development of methods to reduce field operating costs, including reducing production related costs as well as costs associated with plugging and abandoning wells and well site remediation. Consideration will be given to those efforts directed at minimizing the environmental impact of future development activities.
- Development of cost-effective intelligent well monitoring and reservoir modeling methods that will provide operators with the information required for efficient field operations.
- Development of improved methods for well completions and recompletions, including methods of identifying bypassed pay behind pipe, deepening existing wells, and innovative methods for enhancing the volume of reservoir drained per well through fracturing, cost-effective multilaterals, in-fill drilling, or other approaches.
- Implementation and documentation of field tests of emerging technology that will provide operators with the information required to make sound investment decisions regarding the application of that technology.
- Collection and organization of existing well and field data from multiple sources into a readily accessible and usable format that attracts additional investment.
- Creative capture and reuse of industrial waste products (produced water, excess heat) to reduce operating costs or improve recovery.

Additional solicitations may be issued based on assessment of proposals received and available funding.

Funds Available and Anticipated Awards

It is anticipated that $3.21 million will be available for the Small Producer Program Element during fiscal year 2008. Approximately 8 to 12 awards are anticipated to be awarded in the first solicitation of 2008.

The typical award is expected to have duration of one to three years, although shorter or longer awards may be considered if warranted by the nature of the proposed project.

E. Metrics

The Small Producer Program Element goal is to add to the reserve base associated with mature fields operated by small producers. The long term metrics for this program element and the Consortium in general are discussed in Section 2.5.

The short term metrics include the completion of annual milestones that show progress toward meeting the program element objectives. At a minimum, short term metrics through FY2008 shall include:

- Successful issuance of one solicitation
- Successful integration of input from an advisory group that reflects sufficient breadth and depth of industry experience
- Selection and award of a minimum of 8 projects.

In addition, RPSEA will acquire and analyze the data necessary to accurately quantify base case and post technology application case assessments of technically recoverable and economically recoverable reserves, as discussed in Section 2.5. Determination of the Small Producers program benefits will be fully coordinated with NETL's Office of Systems, Analysis and Planning.

F. Milestones

The 2008 solicitation will be conducted after approval and posting of the 2008 Annual Plan, and will remain open for a minimum of 45 days. The review, selection and award process will take no longer than two and one half months.

The steps for developing, releasing, reviewing and selecting projects are listed below:

1. Submit Draft Plan (completed).
2. Establish advisory committee to review solicitations.
3. Successfully issue Solicitation 1.
4. Selection and award of high quality projects based on Solicitation 1 submissions.
5. Develop and apply methodology for quantifying benefits as a result of the application of program-developed enabling technologies.
6. Establish FY2009 R&D priorities based on results of 2007-08 solicitations, inputs from the program advisory committees and URTAC, and modeling of the impacts of various R&D applications.
7. Monitor progress of all awards and make any necessary adjustments to research plans.
8. Satisfactorily report all program deliverables to NETL.

G. Ongoing Activities

The 2007 solicitation focused on application of available technologies for oil and gas recovery, water management issues, cost-effective intelligent well monitoring, and collection and organization of existing data from multiple sources. There was $3.21 million of 2007 funding available for R&D awards under this program element. The solicitation was released on October 17, 2007 and closed on December 3, 2007. The proposals were evaluated by the Technical Advisory Committees, RPSEA and NETL. Selections and awards are anticipated to be made in early February 2008. Approximately 4 to 12 awards are anticipated to be awarded and will be fully funded. The selected offerors will be included in the final version of the 2008 Annual Plan. This information will be provided to the Federal Advisory Committees as the information becomes available.

2.4 Solicitation Process

A. Eligibility

In accordance with Section 999 of EPAct, in order to receive an award, an entity must either be:

a) a United States-owned entity organized under the laws of the United States; or
b) an entity organized under the laws of the United States that has a parent entity organized under the laws of a country that affords-
    a. to United States-owned entities opportunities, comparable to those afforded to any other entity, to participate in any cooperative research venture similar to those authorized under this subtitle;
    b. to United States-owned entities local investment opportunities comparable to those afforded to any other entity; and
    c. adequate and effective protection for the intellectual property rights of United States-owned entities.

RPSEA is not eligible to apply for an award under this program.

B. Organizational/Personal Conflict of Interest

The approved RPSEA Organizational Conflict of Interest Plan will govern all potential conflicts associated with the solicitation and award process.

RPSEA was required to submit an Organizational Conflict of Interest (OCI) Plan which, in accordance with Section 999B(c)(3) of EPAct, addressed the procedures by which RPSEA will (1) ensure it's board members, officers, and employees in a decision-making capacity disclose to DOE any financial interests in or financial relationships with applicants for or recipients of awards under the program and (2) require board members, officers, or employees with disclosed financial relationships or interests to recuse

themselves from any oversight of awards made under the program. RPSEA's OCI Plan was reviewed by DOE. After DOE's comments and questions were addressed, a final OCI Plan was approved.

In addition, the Contract between DOE and RPSEA includes the following OCI clauses: H.22 Organizational Conflict of Interest (NOV 2005); H.23 Organizational Conflict of Interest (OCI) Annual Disclosure; and H.24 Limitation of Future Contracting and Employment.

These Contract clauses and the approved RPSEA OCI Plan will govern potential conflicts associated with the solicitation and award process.

C. Solicitation Approval and Project Selection Process

The overall structure of the solicitation approval and project selection process is illustrated in Figure 2.4 and follows the NETL approved RPSEA "Project Solicitation Process." Within the RPSEA project proposal review and selection process, the TACs will be responsible for providing technical reviews of proposals, while the PACs will be primarily responsible for the selection of proposals for award. NETL will be responsible for the final review and approval of recommended projects. Abstracts of all awards made under RPSEA solicitations will be posted on the RPSEA public website.

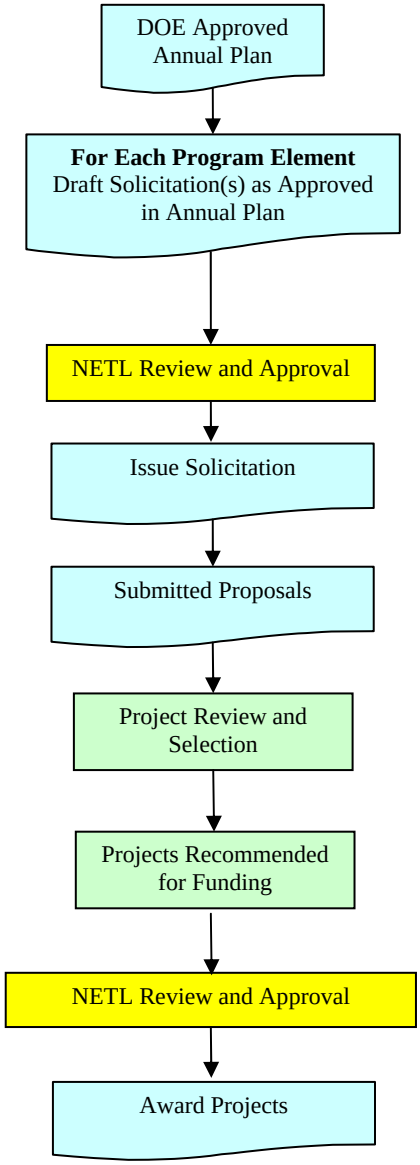


Figure 2.4: Project Solicitation Process

D. Selection Criteria

The following general criteria (which will be more defined in the individual solicitations) will be used to evaluate proposals submitted under the RPSEA program.

- Technical merit and applicable production or reserve impact
- Statement of Project Objectives
- Personnel qualifications, project management capabilities, facilities and equipment, and readiness
- Technology transfer approach
- Cost for the proposed work
- Cost share
- Environmental impact (including an assessment of the impacts, both positive and negative, that would result from the application of a developed technology)
- Health and Safety Quality Assurance/Quality Control
- Exceptions to contract terms and conditions

Weighting factors may vary depending on the specific technology theme and will be clearly identified in each solicitation.

A bidder may be required to meet with the review committee to present their proposal and to answer any outstanding questions.

The following additional criteria will be used to evaluate proposals submitted under the Small Producer program element: Approach to application of the results, involvement of small producers, and the overall strength of the consortium.

E. Schedule and Timing

The schedule for the 2008 solicitations will be determined in consultation with NETL after the 2008 Annual Plan has been approved and posted. It is anticipated that solicitations will be issued shortly after Plan approval. After issuance, solicitations will remain open for a minimum of 45 days.

F. Proposal Specifications

The structure and required elements of proposals submitted in response to the solicitations, as well as the specific details regarding format and delivery, will be developed in consultation with DOE and will be provided in each solicitation.

G. Funding Estimates

It is anticipated that $14.96 million per year will be available for the UDW program element and $13.89 million per year for the Unconventional Resources program element. Approximately 5 to 20 awards are anticipated within each of these program elements during FY2008. The typical award is expected to have duration of one to three years, although shorter or longer awards may be considered if warranted by the nature of the proposed project. Under the Stage/Gate approach described in Section 2.5, all projects will be fully funded to the completion of the appropriate decision point identified in each contract, which may include multiple stages. Once a decision is made to move to the next stage or decision point, additional funding will be provided from available funds.

It is anticipated that $3.21 million per year will be available for the Small Producer program element. Approximately 4 to 12 awards are anticipated during FY 2008. The typical award is expected to have duration of two years, although shorter or longer awards may be considered if warranted by the nature of the proposed project.

H. Advertising of Solicitations

Advertising of each solicitation will be implemented in a manner that insures wide distribution to the specific audience targeted by each solicitation.

The vehicles used will include at a minimum:

- Publication on the NETL website, supported by DOE press releases
- Publication on the RPSEA website, supported by RPSEA press releases and newsletters
- Announcements distributed via e-mail to targeted lists (e.g., Small Producer solicitation to members of state producer organizations and IPAA).

Other vehicles that may be used include:

- Advertising in recognized industry publications (e.g., Oil and Gas Journal, Hart's E&P, Offshore, American Oil and Gas Reporter, etc.)
- Presentations at industry meetings by both RPSEA and NETL representatives, as appropriate given the timing of the solicitations.

I. Additional Requirements for Awards Specified in Section 999

The following items are specified in Section 999C as requirements for awards. This information must be included in the solicitations.

- ***Demonstration Projects –*** An application for an award for a demonstration project must describe with specificity the intended commercial use of the technology to be demonstrated.
- ***Flexibility in Locating Demonstration Projects –*** A demonstration project relating to an ultra-deepwater (≥1500 meters) technology or an ultra-deepwater architecture may be conducted in deepwater depths (>200 but <1500 meters).

- ***Intellectual Property Agreements –*** If an award is made to a consortium, the consortium must provide a signed contract agreed to by all members of the consortium describing the rights of each member to intellectual property used or developed under the award.
- ***Technology Transfer –*** 2.5 percent of the amount of each award must be designated for technology transfer and outreach activities.
- ***Information Sharing –*** All results of the research administered by the program consortium shall be made available to the public consistent with Department policy and practice on information sharing and intellectual property agreements.

2.5 Project Management

RPSEA will employ a Stage/Gate approach to the research, development, and commercialization (RD&C) process for each awarded project. The Stage/Gate process (Figure 2.5) is a method of logical thought and decision making designed to facilitate the efficient development of new technologies. The process will integrate three parallel, but interdependent streams of activities—technical, business, and administrative—needed to develop a product from its initial conception through research and on to the marketplace. These activities will be integrated, such that progressively better information about the project and product—market potential, customer needs and wants, benefit-to-cost ratio, economics, and technical feasibility—is provided at each stage of the process. The process will be dynamic and flexible so that as RPSEA stakeholders' and project managers' needs evolve, the process can evolve as well.

Figure 2.5: Stages and Gates Process Schematic

Each project will be designed to include a series of stages punctuated by decision points, whereby the contributors and decision makers will make a decision to: 1) go forward with the project, 2) go back to resolve key issues, or 3) terminate the project.

Each stage is designed to make technical progress and gather the information needed to move the project to the next decision point and on to the next gate. These information collection activities are not ends in themselves, but are the means to ultimately produce a successful product.

The gathering and analysis of information in each stage is focused on reducing levels of uncertainty, and thus risk. Armed with this information, project contributors can make sound technical and business decisions. Initial stages of research, development, and commercialization generally encounter the highest *technical* risks while later stages face

the greatest *business* risks. The project contributors must address both technical and business risks and attempt to reduce the overall uncertainly of the project.

In addition to helping manage risk, the structure of the RD&C process to be employed by RPSEA provides flexibility. For example, a project may begin the RD&C process at whatever stage is most appropriate for the circumstances. Consider a manufacturer who desires to broaden applications of an existing product. It may seek assistance exploring potential applications of the product to address a critical need other than that for which it was originally developed. Thus, from RPSEA's perspective, the project might then begin the RD&C process after the product has already been developed, i.e. at a stage well beyond Idea Generation (Stage 1).

Just as a project may begin at whatever stage is most appropriate, a project may end at whatever stage is most appropriate. For example, if RPSEA, NETL or a manufacturer is satisfied that RPSEA has added the research and development value needed, and all parties agree that the manufacturer should continue with commercialization independently, RPSEA's support of the work may end successfully before the last gate (Gate 7).

Each gate in the process will have the following specifications:

- A set of required information from the preceding stage which is reviewed by the gatekeepers
- A set of quantitative and/or qualitative criteria to judge the merits and progress of the project
- A decision on whether the project should go ahead or be stopped
- Approval or release of funds
- A path forward for the next stage

Each gate will have its own set of quantitative and/or qualitative criteria for deciding whether the project should be continued into the next stage. These criteria are agreed upon in advance by the project contributors and the gatekeeper(s) for that gate. The evaluation criteria will help to answer the following questions:

- Does the concept still have strong potential for being a marketable product?
- Does the product concept still fit with the strategies, goals, and objectives of the appropriate RPSEA program?
- Have essential activities been completed at the proper level of detail?
- Is the project on time and within budget? Have key criteria been met since the previous gate?
- Should the project be continued to the next stage of development? Should it be terminated?
- What activities need to be performed in the next stage of the project? What key information is needed for making decisions at the next gate?

The current stage of the project is determined by whether it has met all the agreed upon criteria for the preceding gates. Therefore, a project can only be in one stage at a given point in time. For example, a project cannot be at the deployment stage (Stage 6) when technical development activities (Stage 4) are still ongoing.

Progression through each gate is determined by gatekeepers who are identified at the time the project begins the RD&C process. These gatekeepers determine whether the project moves forward given the information developed in the preceding stage. Depending on the gate, gatekeepers may be RPSEA members or advisory committee members, program element management, or executive management.

2.6 Technology Transfer

In order to meet the program goal of maximizing the value of the nation's natural gas and oil resources, as well as increasing federal royalty receipts, it is essential that technology developed under this program be rapidly and effectively applied by operators exploring for and developing new resources. The goal for technology transfer under this program is to assure the engagement of participants all along the technology value chain from conceptual development to commercial application in order to maximize the impact of program technology.

Effective technology transfer must include the initial articulation of technology needs by the ultimate users of the technology; involve the various stakeholders in the technology development continuum; and have continuous feedback loops from each stage in the process to either validate or calibrate research or technologies. The technology transfer objectives for the early years of the program will focus on developing and implementing a set of processes designed to ensure coordinated transfer of technology across the anticipated wide spectrum of technology investors, developers, deployers and end users likely to be associated with the program.

The specific Technology Transfer objectives for years 1 and 2 of the program include:

1. Incorporate provisions in the solicitations that provide for the allocation of 2.5% of the funding for each project to technology transfer activities. Develop and incorporate language that requires each applicant for an award to propose a technology transfer approach with the understanding that up to 40% of the 2.5% designated may be directed for program level technology transfer. Develop and incorporate language in the Model Contract that provides for the coordination of technology transfer across multiple related projects, as specified above.
2. Engage the PAC and TAC members through involvement in needs assessment, project selection and ongoing project review, in order to promote ongoing interest in developing projects and facilitate field tests and demonstrations using operator wells, data and facilities.
3. Conduct at least one Project Review meeting for RPSEA members and the public.

The approach to technology transfer is designed to address program level goals through a coordinated process that combines the technology transfer efforts associated with related projects while honoring the contractual commitment to fund technology transfer through the allocation of 2.5% of program funding for this purpose.

As part of the administration of the program, RPSEA will conduct the following program-level technology transfer activities.

- RPSEA will initiate a Knowledge Management Database by posting on its public website a list of projects, including goals, objectives, technical status assessments, results and accomplishments, reports and key personnel contact information. These website postings will be updated monthly.

- Periodic project reviews with PACs (and TACs as required) will be designed to ensure that the results of related projects are presented in a way that highlights their interconnection and allows the advisory bodies to identify opportunities for the evaluation and application of project results.

In order to maximize the impact of the 2.5% allocated to Technology Transfer, RPSEA is implementing the following approach:

- Each solicitation included the requirement for a plan for technology transfer. The solicitation will instruct offerors to propose an approach for technology transfer for their project understanding that up to 40% of the 2.5% designated for technology transfer may be used by a third party that is coordinating technology transfer for a number of projects or at the program level.

- RPSEA is developing a program level technology transfer approach for the portfolio of projects to be funded. This plan will be based on maximizing the impact of the entire project portfolio, including new and ongoing projects, and will consider the input associated with the technology transfer plans submitted in successful proposals.

- RPSEA and the selected awardee will jointly develop a project level technology transfer approach.

- The R&D contracts awarded will include requirements for the expenditure of funds allocated to technology transfer in accordance with the portfolio level plan. In some cases, especially with large projects with few deliverables, the technology transfer may be handled entirely by the awardee in accordance with an approved plan. In other cases, especially smaller projects where the technology transfer effort will be more effective if coordinated with other projects, the contractor may be required to subcontract part of the technology transfer activities to a competitively selected third party that is coordinating technology transfer for a number of projects for a program.

A portion of the 2.5% funding will be allocated to start-up a Knowledge Management Database. The preservation of data from the R&D projects and Technology Transfer program must be retained in a database for maximum dissemination (both near and long term) to the end users. Elements of a successful database resource should include:

- Technology Transfer funding component be used to create information to be input into a web-based Knowledge Management database.
- RPSEA will populate a Knowledge Management database with R&D results to serve as a resource of technology for industry.
- Knowledge Management should have the following aspects: be web-based; user sign-in and password (requires registration but open to public)**;** standard template format for input; subject matter review process; a knowledge push and/or community notification system to stimulate and maintain interest; and expected criteria for success.
- Existing petroleum technology transfer databases such as the one already developed by the Petroleum Technology Transfer Council (PTTC) should be used to the maximum extent possible to reduce development and maintenance costs.

The objective of this approach is to ensure a coordinated technology transfer effort that maximizes the impact of the entire program.

2.7 Program Benefits Assessment and Performance Metrics

The primary overall goal of the Consortium-administered R&D program is to maximize the value to the Nation of domestic natural gas and oil by increasing the supply through cost reduction and efficiency improvement. Measuring the success of the program in meeting this goal will require monitoring and assessment on several levels:

1. ***Quantifying long-term program level benefits*** – Incremental additions to gas and oil supply, accelerated production rates, increased Federal or State royalty revenues, associated economic benefits (e.g., increased employment, lower energy prices, avoided costs), environmental benefits (e.g., reduced footprint, reduced emissions, etc.), "options" benefits (i.e., increase in technology options available to industry), and "knowledge" benefits (i.e., improved scientific understanding that can lead to future benefits). These benefits must result from the application of technologies developed by the Program.

2. ***Monitoring and reporting shorter-term program performance metrics*** – Milestones met, outreach achieved (e.g., papers delivered, workshops sponsored, awards received), technology transfer achieved (e.g., patents filed, company start-ups initiated, market share of commercialized technologies), level of industry interest developed (i.e., matching funds and in-kind contributions).

3. ***Monitoring and reporting program management performance and budget metrics*** – Budgeted versus actual cost metrics, project schedule adherence,

invoice processing metrics, research project report quality, and timeliness metrics, etc.

Level Three is directed primarily at measuring the performance of the Consortium in administering the program, Level Two at measuring the performance of the Consortium (through the research contractors) in achieving the objectives set forth in the Plan, and Level One at quantifying the overall success of the Program in achieving its primary goal. Each requires a monitoring and assessment plan and is discussed in the following sections.

A. Quantifying Long-Term Benefits

A long-term benefits assessment methodology will be developed that will result in a scientifically defensible and auditable determination of the economic benefits resulting from the R&D investments made. The long term benefits assessment will be coordinated with and drive future prioritization of technology focus areas in each of the Consortium's three focus areas specified in EPAct Section 999. This benefits assessment methodology and a plan for its implementation will be completed before the end of FY 2008 and its development will be fully coordinated with the SCNGO and OSAP at the NETL. The methodology will be designed to meet the data and reporting requirements of NETL. Further, the methodology will be designed to produce assessments that can easily be aligned with similar assessments produced for other government entities (e.g., GAO).

The methodology to be developed may include, but will not be limited to, the following elements:

1. A Benefits Matrix that correlates the *types* of benefits (e.g., economic, environmental, security) with the *category* of benefits (e.g., measured/estimated benefits actually realized, "options" benefits from increased industry flexibility, "knowledge" benefits from increased understanding). This matrix will be relevant benefits that can be measured or estimated.

2. The establishment of baseline values for key metrics (e.g. current values for technically and economically recoverable unconventional natural gas in particular basins, current deepwater production rates, etc.), as well as a methodology for determining changes in these key metrics over time, including projected technology advancement in the absence of government activities. This may involve the independent collection and analysis of data by the Consortium where public data (e.g., MMS or EIA) is insufficient to provide the necessary level of detail.

3. A method for estimating the economic impacts that occur from an incremental increase in reserves or production rate and translating these into an economic benefit. For example: increased production from deepwater fields as a result of Consortium-developed technologies will reduce oil or gas imports and increase domestic supply; how does this translate into increased value for consumers? The

application of a lower cost completion technology developed by the Program results in the drilling of additional gas wells; how does this translate into additional jobs and economic growth in the areas impacted?

4. A method for validating benefits associated with the application of specific Program-developed technologies. This may include "before-and-after" estimates from the operators involved with demonstrating a technology, market share estimates from service companies commercializing a technology, and surveys of Consortium members and other operators applying a technology. The broad and deep relationships between the Consortium and the producing community will enable a larger number of detailed "testimonials" of the benefits of Program-developed technologies, where they have occurred.

5. A model for the expected long-term impact of new technology applications where commercialization has not advanced to the degree where market-based measurements can be easily made. A number of modeling approaches to this problem have been employed by EIA, DOE, and others. The Consortium will review these models and select an approach in consultation with NETL.

6. A plan for identifying and tracking increases in industry investment on development projects and spin-off technologies, within both service and producer market sectors, that directly result from (or indirectly evolve from) Program-developed technologies.

7. A plan for independent critical review of the benefits assessment methodology.

B. Monitoring Shorter-Term Performance Metrics

The program will develop quantitative short-term performance metrics. Some, but not all of the short-term metrics will require that individual project metrics be established. The degree to which individual project objectives are met and the degree to which the roll-up of project objectives meet program objectives must be quantified. However, quantification of project-specific metrics will require the research program to be implemented and underway. Accordingly, the following steps will be followed with regard to quantifying short-term Program impacts that are project dependent.

1. The first round of project proposals must be awarded before establishing project level objectives and metrics.
2. During this time, the Consortium will review with DOE and select the most appropriate methodology for quantifying and tracking shorter-term program metrics.
3. After a methodology has been selected, a baseline will be established for all areas where short term metrics will be measured.

4. With the above information in hand, a projection of program short-term results based on an assumed R&D budget per year for a specified number of years will be modeled.
5. Based on the results of Step 4, more precise and quantifiable program objectives will be established.
6. The results will be reviewed with each of the Consortium advisor groups before finalization and submission to DOE for approval.
7. The process will be repeated on a yearly basis to quantify incremental project/program results and cumulative impacts.

The degree to which project milestones are completed on time, papers are delivered, patents are filed, companies contribute cost-share funds, and new technologies are determined to be successful and become commercialized are important indicators of the Program's short-term success or failure. However, achieving these short-term goals is also critical to long-term Program success. The long term success of the program will ultimately be determined by the degree to which these short-term achievements are translated into the benefits outlined earlier.

C. Monitoring and Reporting Program Management Performance and Budget Metrics

In addition, as detailed within the RPSEA Management Plan, a monitoring process has been implemented for tracking budgeted versus actual financial information and other project schedule parameters. This monitoring process includes measurements of:

1. ***Obligated/uncosted funding in relation to total funds*** – The Consortium will establish a database to track obligated funding as well as uncosted amounts for the total program (including administration), as well as for each project. Funds will be tracked by year appropriated, in order to determine the age of all funds in all categories.

2. ***Earned value assessment for each research project including individual project cost and schedule variation*** – Earned value management (EVM) metrics will measure the cost and schedule performance of each research project. These metrics will be based on three essential variables:

- **Budgeted Cost of Work Scheduled (BCWS)** which is extracted from the initial project plan. This variable lays down the baseline of planned expenditures at any given time.
- **Budgeted Cost of Work Performed (BCWP)** which is extracted from the initial plan and computed based on the reported work completed.
- **Actual Cost of Work Performed (ACWP)** which is extracted from a project's periodic reports and is the actual expenditure to complete a given task.

From these three variables, the Consortium administrator will determine the cost and schedule variance for each project.

Cost and schedule data will be collected from researchers on a schedule negotiated with the provider during the contract finalization process. The nature and characteristics of projects funded under the program will vary widely. The reporting frequency established for each project will consider these differences and vary as appropriate for individual projects, and will balance the need for information required to effectively monitor project execution against project schedules, milestones, and magnitude.

3. ***Project completion targets (within budget and project period)*** – The Consortium will utilize the three variables identified above to compute and report the estimated time at completion (ETAC) and estimated cost at completion (ECAC) for each project.

4. ***Adherence to project schedule (for solicitation and awards)*** – The Consortium will apply the same earned value techniques described above to the program level schedule for developing solicitations and making project awards. Earned value measurements will be made against the baseline schedule for the solicitation process.

In addition to the above, the Consortium will develop procedures to capture, monitor, and analyze data related to:

- Minimization of the amount of time from invoice to payment,
- Processing time for project change requests,
- Project report quality and adherence to set standards, and
- The number of small business, minority owned and other disadvantaged category program participants.

Acronyms

AMIGA	All Modular Industry Growth Assessment
BOD	Board of Directors
CBNG	coal bed natural gas
CDUEC	Center for Drilling Under Extreme Conditions
CEI	Center for Environmental Impacts
CEUOR	Center for Enhanced and Unconventional Oil Recovery
DOE	Department of Energy
E&P	Exploration and Production
EAG	Environmental Advisory Group
EIA	Energy Information Administration
EOR	enhanced oil recovery
EPA	Environmental Protection Agency
EPAct	Energy Policy Act
GIS	geographic information system
GTI	Gas Technology Institute
HPHT	high pressure and high temperature
LIDAR	light detection and ranging
MMS	Minerals Management Service
MMV	measuring, monitoring, and verification
NEMS	National Energy Modeling System
NETL	National Energy Technology Laboratory
NMT	New Mexico Tech University
NPC	National Petroleum Council
O&G	oil & gas
OCI	Organizational Conflict of Interest Plan
OCS	Outer Continental Shelf
ORD	Office of Research and Development
OSAP	Office of Systems, Analysis and Planning
PAC	Program Advisory Committee
PTTC	Petroleum Technology Transfer Council
RAG	Research Advisory Group
RFP	Request for Proposal
ROP	rate of penetration
RPSEA	Research Partnership to Secure Energy for America
S1	Solicitation 1 of 3 planned for Ultra-Deepwater
S2	Solicitation 2 of 3 planned for Ultra-Deepwater
S3	Solicitation 3 of 3 planned for Ultra-Deepwater
SAC	Strategic Advisory Committee
SAIC	Science Applications International Corporation
SCNGO	Strategic Center for Natural Gas and Oil
SDI	subsurface drip irrigation
SWC	Stripper Well Consortium
TAC	Technical Advisory Committee
TCF	trillion cubic feet
TVD	total volume daily
UDS	Ultra-deep single cutter Drilling Simulator
UDW	Ultra-Deepwater

Appendix A: EPAct 2005 - Section 999

Subtitle J--Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Resources

SEC. 999A. PROGRAM AUTHORITY.

(a) *In General*.--The Secretary shall carry out a program under this subtitle of research, development, demonstration, and commercial application of technologies for ultra-deepwater and unconventional natural gas and other petroleum resource exploration and production, including addressing the technology challenges for small producers, safe operations, and environmental mitigation (including reduction of greenhouse gas emissions and sequestration of carbon).

(b) *Program Elements*.--The program under this subtitle shall address the following areas, including improving safety and minimizing environmental impacts of activities within each area:

(1) Ultra-deepwater architecture and technology, including drilling to formations in the Outer Continental Shelf to depths greater than 15,000 feet.

(2) Unconventional natural gas and other petroleum resource exploration and production technology.

(3) The technology challenges of small producers.

(4) Complementary research performed by the National Energy Technology Laboratory for the Department.

(c) *Limitation on Location of Field Activities*.--Field activities under the program under this subtitle shall be carried out only--

(1) in--

(A) areas in the territorial waters of the United States not under any Outer Continental Shelf moratorium as of September 30, 2002;

(B) areas onshore in the United States on public land administered by the Secretary of the Interior available for oil and gas leasing, where consistent with applicable law and land use plans; and

(C) areas onshore in the United States on State or private land, subject to applicable law; and

(2) with the approval of the appropriate Federal or State land management agency or private land owner.

(d) *Activities at the National Energy Technology Laboratory*.--The Secretary, through the National Energy Technology Laboratory, shall carry out a program of research and other activities complementary to and supportive of the research programs under subsection (b).

(e) *Consultation With Secretary of the Interior*.--In carrying out this subtitle, the Secretary shall consult regularly with the Secretary of the Interior.

SEC. 999B. ULTRA-DEEPWATER AND UNCONVENTIONAL ONSHORE NATURAL GAS AND OTHER PETROLEUM RESEARCH AND DEVELOPMENT PROGRAM.

(a) *In General*.--The Secretary shall carry out the activities under section 999A, to maximize the value of natural gas and other petroleum resources of the United States, by increasing the supply of such resources, through reducing the cost and increasing the efficiency of exploration for and production of such resources, while improving safety and minimizing environmental impacts.

(b) *Role of the Secretary*.--The Secretary shall have ultimate responsibility for, and oversight of, all aspects of the program under this section.

(c) *Role of the Program Consortium*.--

(1) IN GENERAL.--The Secretary shall contract with a corporation that is structured as a consortium to administer the programmatic activities outlined in this chapter. The program consortium shall--

(A) administer the program pursuant to subsection (f)(3), utilizing program administration funds only ;

(B) issue research project solicitations upon approval of the Secretary or the Secretary's designee;

(C) make project awards to research performers upon approval of the Secretary or the Secretary's designee;

(D) disburse research funds to research performers awarded under subsection (f) as directed by the Secretary in accordance with the annual plan under subsection (e); and

(E) carry out other activities assigned to the program consortium by this section.

(2) **LIMITATION**.--The Secretary may not assign any activities to the program consortium except as specifically authorized under this section.

(3) **CONFLICT OF INTEREST**.--

(A) **PROCEDURES**.--The Secretary shall establish procedures--

(i) to ensure that each board member, officer, or employee of the program consortium who is in a decision-making capacity under subsection (f)(3) shall disclose to the Secretary any financial interests in, or financial relationships with, applicants for or recipients of awards under this section, including those of his or her spouse or minor child, unless such relationships or interests would be considered to be remote or inconsequential; and

(ii) to require any board member, officer, or employee with a financial relationship or interest disclosed under clause (i) to recuse himself or herself from any oversight under subsection (f)(4) with respect to such applicant or recipient.

(B) **FAILURE TO COMPLY**.--The Secretary may disqualify an application or revoke an award under this section if a board member, officer, or employee has failed to comply with procedures required under subparagraph (A)(ii).

(d) *Selection of the Program Consortium*.--

(1) **IN GENERAL**.--The Secretary shall select the program consortium through an open, competitive process.

(2) **MEMBERS**.--The program consortium may include corporations, trade associations, institutions of higher education, National Laboratories, or other research institutions. After submitting a proposal under paragraph (4), the program consortium may not add members without the consent of the Secretary.

(3) **REQUIREMENT OF SECTION 501(c)(3) STATUS**.--The Secretary shall not select a consortium under this section unless such consortium is an organization described in section 501(c)(3) of the Internal Revenue Code of 1986 and exempt from tax under such section 501(a) of such Code.

(4) **SCHEDULE.--**Not later than 90 days after the date of enactment of this Act, the Secretary shall solicit proposals from eligible consortia to perform the duties in subsection (c)(1), which shall be submitted not later than 180 days after the date of enactment of this Act. The Secretary shall select the program consortium not later than 270 days after such date of enactment.

(5) **APPLICATION**.--Applicants shall submit a proposal including such information as the Secretary may require. At a minimum, each proposal shall--

(A) list all members of the consortium;

(B) fully describe the structure of the consortium, including any provisions relating to intellectual property; and

(C) describe how the applicant would carry out the activities of the program consortium under this section.

(6) **ELIGIBILITY**.--To be eligible to be selected as the program consortium, an applicant must be an entity whose members have collectively demonstrated capabilities and experience in planning and managing research, development, demonstration, and commercial application programs for ultra-deepwater and unconventional natural gas or other petroleum exploration or production.

(7) **FOCUS AREAS FOR AWARDS**.--

(A) **ULTRA-DEEPWATER RESOURCES**.--Awards from allocations under section 999H(d)(1) shall focus on the development and demonstration of individual exploration and production technologies as well as integrated systems technologies including new architectures for production in ultra-deepwater.

(B) **UNCONVENTIONAL RESOURCES**.--Awards from allocations under section 999H(d)(2) shall focus on areas including advanced coalbed methane, deep drilling, natural gas production from tight sands, natural gas production from gas shales, stranded gas, innovative exploration and production techniques, enhanced recovery techniques, and environmental mitigation of unconventional natural gas and other petroleum resources exploration and production.

(C) **SMALL PRODUCERS**.--Awards from allocations under section 999H(d)(3) shall be made to consortia consisting of small producers or organized primarily for the benefit of small producers, and shall focus on areas including complex geology involving rapid changes in the type and quality of the oil and gas reservoirs across the reservoir; low reservoir pressure; unconventional natural gas reservoirs in coalbeds, deep reservoirs, tight sands, or shales; and unconventional oil reservoirs in tar sands and oil shales.

(e) *Annual Plan*.--

(1) **IN GENERAL.--**The program under this section shall be carried out pursuant to an annual plan prepared by the Secretary in accordance with paragraph (2).

(2) **DEVELOPMENT.--**

(A) **SOLICITATION OF RECOMMENDATIONS.--**Before drafting an annual plan under this subsection, the Secretary shall solicit specific written recommendations from the program consortium for each element to be addressed in the plan, including those described in paragraph (4). The program consortium shall submit its recommendations in the form of a draft annual plan.

(B) **SUBMISSION OF RECOMMENDATIONS; OTHER COMMENT.--**The Secretary shall submit the recommendations of the program consortium under subparagraph (A) to the Ultra-Deepwater Advisory Committee established under section 999D(a) and to the Unconventional Resources Technology Advisory Committee established under section 999D(b), and such Advisory Committees shall provide to the Secretary written comments by a date determined by the Secretary. The Secretary may also solicit comments from any other experts.

(C) **CONSULTATION.--**The Secretary shall consult regularly with the program consortium throughout the preparation of the annual plan.

(3) **PUBLICATION.--**The Secretary shall transmit to Congress and publish in the Federal Register the annual plan, along with any written comments received under paragraph (2)(A) and (B).

(4) **CONTENTS.--**The annual plan shall describe the ongoing and prospective activities of the program under this section and shall include--

(A) a list of any solicitations for awards to carry out research, development, demonstration, or commercial application activities, including the topics for such work, who would be eligible to apply, selection criteria, and the duration of awards; and

(B) a description of the activities expected of the program consortium to carry out subsection (f)(3).

(5) **ESTIMATES OF INCREASED ROYALTY RECEIPTS**.--The Secretary, in consultation with the Secretary of the Interior, shall provide an annual report to Congress with the President's budget on the estimated cumulative increase in Federal royalty receipts (if any) resulting from the implementation of this subtitle. The initial report under this paragraph shall be submitted in the first President's budget following the completion of the first annual plan required under this subsection.

(f) *Awards*.--

(1) **IN GENERAL**.--Upon approval of the Secretary the program consortium shall make awards to research performers to carry out research, development, demonstration, and commercial application activities under the program under this section. The program consortium shall not be eligible to receive such awards, but provided that conflict of interest procedures in section 999B(c)(3) are followed, entities who are members of the program consortium are not precluded from receiving research awards as either individual research performers or as research performers who are members of a research collaboration.

(2) **PROPOSALS**.--Upon approval of the Secretary the program consortium shall solicit proposals for awards under this subsection in such manner and at such time as the Secretary may prescribe, in consultation with the program consortium.

(3) **OVERSIGHT**.--

(A) **IN GENERAL**.--The program consortium shall oversee the implementation of awards under this subsection, consistent with the annual plan under subsection (e), including disbursing funds and monitoring activities carried out under such awards for compliance with the terms and conditions of the awards.

(B) **EFFECT**.--Nothing in subparagraph (A) shall limit the authority or responsibility of the Secretary to oversee awards, or limit the authority of the Secretary to review or revoke awards.

(g) *Administrative Costs*.--

(1) **IN GENERAL**.--To compensate the program consortium for carrying out its activities under this section, the Secretary shall provide to the program consortium funds sufficient to administer the program. This compensation may include a management fee consistent with Department of Energy contracting practices and procedures.

(2) **ADVANCE**.--The Secretary shall advance funds to the program consortium upon selection of the consortium, which shall be deducted from amounts to be provided under paragraph (1).

(h) *Audit*.--The Secretary shall retain an independent auditor, which shall include a review by the General Accountability Office, to determine the extent to which funds provided to the program consortium, and funds provided under awards made under subsection (f), have been expended in a manner consistent with the purposes and requirements of this subtitle. The auditor shall transmit a report (including any review by the General Accountability Office) annually to the Secretary, who shall transmit the report to Congress, along with a plan to remedy any deficiencies cited in the report.

(i) *Activities by the United States Geological Survey*.--The Secretary of the Interior, through the United States Geological Survey, shall, where appropriate, carry out programs of long-term research to complement the programs under this section.

(j) *Program Review and Oversight*.--The National Energy Technology Laboratory, on behalf of the Secretary, shall (1) issue a competitive solicitation for the program consortium, (2) evaluate, select, and award a contract or other agreement to a qualified program consortium, and (3) have primary review and oversight responsibility for the program consortium, including review and approval of research awards proposed to be made by the program consortium, to ensure that its

activities are consistent with the purposes and requirements described in this subtitle. Up to 5 percent of program funds allocated under paragraphs (1) through (3) of section 999H(d) may be used for this purpose, including program direction and the establishment of a site office if determined to be necessary to carry out the purposes of this subsection.

SEC. 999C. ADDITIONAL REQUIREMENTS FOR AWARDS.

(a) *Demonstration Projects*.--An application for an award under this subtitle for a demonstration project shall describe with specificity the intended commercial use of the technology to be demonstrated.

(b) *Flexibility in Locating Demonstration Projects*.--Subject to the limitation in section 999A(c), a demonstration project under this subtitle relating to an ultra-deepwater technology or an ultra-deepwater architecture may be conducted in deepwater depths.

(c) *Intellectual Property Agreements*.--If an award under this subtitle is made to a consortium (other than the program consortium), the consortium shall provide to the Secretary a signed contract agreed to by all members of the consortium describing the rights of each member to intellectual property used or developed under the award.

(d) *Technology Transfer*.--2.5 percent of the amount of each award made under this subtitle shall be designated for technology transfer and outreach activities under this subtitle.

(e) *Cost Sharing Reduction for Independent Producers*.--In applying the cost sharing requirements under section 988 to an award under this subtitle the Secretary may reduce or eliminate the non-Federal requirement if the Secretary determines that the reduction is necessary and appropriate considering the technological risks involved in the project.

(f) *Information Sharing*.--All results of the research administered by the program consortium shall be made available to the public consistent with Department policy and practice on information sharing and intellectual property agreements.

SEC. 999D. ADVISORY COMMITTEES.

(a) *Ultra-Deepwater Advisory Committee*.--

(1) ESTABLISHMENT.--Not later than 270 days after the date of enactment of this Act, the Secretary shall establish an advisory committee to be known as the Ultra-Deepwater Advisory Committee.

(2) **MEMBERSHIP**.--The Advisory Committee under this subsection shall be composed of members appointed by the Secretary, including--

(A) individuals with extensive research experience or operational knowledge of offshore natural gas and other petroleum exploration and production;

(B) individuals broadly representative of the affected interests in ultra-deepwater natural gas and other petroleum production, including interests in environmental protection and safe operations;

(C) no individuals who are Federal employees; and

(D) no individuals who are board members, officers, or employees of the program consortium.

(3) **DUTIES**.--The Advisory Committee under this subsection shall—

(A) advise the Secretary on the development and implementation of programs under this subtitle related to ultradeepwater natural gas and other petroleum resources; and

(B) carry out section 999B(e)(2)(B).

(4) **COMPENSATION**.--A member of the Advisory Committee under this subsection shall serve without compensation but shall receive travel expenses in accordance with applicable provisions under subchapter I of chapter 57 of title 5, United States Code.

(b) *Unconventional Resources Technology Advisory Committee*.--

(1) **ESTABLISHMENT**.--Not later than 270 days after the date of enactment of this Act, the Secretary shall establish an advisory committee to be known as the Unconventional Resources Technology Advisory Committee.

(2) **MEMBERSHIP**.--The Secretary shall endeavor to have a balanced representation of members on the Advisory Committee to reflect the breadth of geographic areas of potential gas supply. The Advisory Committee under this subsection shall be composed of members appointed by the Secretary, including--

(A) a majority of members who are employees or representatives of independent producers of natural gas and other petroleum, including small producers;

(B) individuals with extensive research experience or operational knowledge of unconventional natural gas and other petroleum resource exploration and production;

(C) individuals broadly representative of the affected interests in unconventional natural gas and other petroleum resource exploration and production, including interests in environmental protection and safe operations;

(D) individuals with expertise in the various geographic areas of potential supply of unconventional onshore natural gas and other petroleum in the United States;

(E) no individuals who are Federal employees; and

(F) no individuals who are board members, officers, or employees of the program consortium.

(3) **DUTIES**.--The Advisory Committee under this subsection shall--

(A) advise the Secretary on the development and implementation of activities under this subtitle related to unconventional natural gas and other petroleum resources; and

(B) carry out section 999B(e)(2)(B).

(4) **COMPENSATION**.--A member of the Advisory Committee under this subsection shall serve without compensation but shall receive travel expenses in accordance with applicable provisions under subchapter I of chapter 57 of title 5, United States Code.

(c) *Prohibition*.--No advisory committee established under this section shall make recommendations on funding awards to particular consortia or other entities, or for specific projects.

SEC. 999E. LIMITS ON PARTICIPATION.

An entity shall be eligible to receive an award under this subtitle only if the Secretary finds--

(1) that the entity's participation in the program under this subtitle would be in the economic interest of the United States; and

(2) that either--

(A) the entity is a United States-owned entity organized under the laws of the United States; or

(B) the entity is organized under the laws of the United States and has a parent entity organized under the laws of a country that affords--

(i) to United States-owned entities opportunities, comparable to those afforded to any other entity, to participate in any cooperative research venture similar to those authorized under this subtitle;

(ii) to United States-owned entities local investment opportunities comparable to those afforded to any other entity; and

(iii) adequate and effective protection for the intellectual property rights of United States-owned entities.

SEC. 999F. SUNSET.
The authority provided by this subtitle shall terminate on September 30, 2014.

SEC. 999G. DEFINITIONS.

In this subtitle:

(1) **DEEPWATER**.--The term “deepwater” means a water depth that is greater than 200 but less than 1,500 meters.

(2) **INDEPENDENT PRODUCER OF OIL OR GAS**.--

(A) **IN GENERAL**.--The term “independent producer of oil or gas” means any person that produces oil or gas other than a person to whom subsection (c) of section 613A of the Internal Revenue Code of 1986 does not apply by reason of paragraph (2) (relating to certain retailers) or paragraph (4) (relating to certain refiners) of section 613A(d) of such Code.

(B) **RULES FOR APPLYING PARAGRAPHS (2) AND (4) OF SECTION 613A**(d).--For purposes of subparagraph (A), paragraphs (2) and (4) of section 613A(d) of the Internal Revenue Code of 1986 shall be applied by substituting `"calendar year" for "taxable year" each place it appears in such paragraphs.

(3) **PROGRAM ADMINISTRATION FUNDS**.--The term "program administration funds" means funds used by the program consortium to administer the program under this subtitle, but not to exceed 10 percent of the total funds allocated under paragraphs (1) through (3) of section 999H(d).

(4) **PROGRAM CONSORTIUM**.--The term "program consortium" means the consortium selected under section 999B(d).

(5) **PROGRAM RESEARCH FUNDS**.--The term "program research funds" means funds awarded to research performers by the program consortium consistent with the annual plan.

(6) **REMOTE OR INCONSEQUENTIAL**.--The term "remote or inconsequential" has the meaning given that term in regulations issued by the Office of Government Ethics under section 208(b)(2) of title 18, United States Code.

(7) **SMALL PRODUCER**.--The term "small producer" means an entity organized under the laws of the United States with production levels of less than 1,000 barrels per day of oil equivalent.

(8) **ULTRA-DEEPWATER**.--The term "ultra-deepwater" means a water depth that is equal to or greater than 1,500 meters.

(9) **ULTRA-DEEPWATER ARCHITECTURE**.--The term "ultra-deepwater architecture" means the integration of technologies for the exploration for, or production of, natural gas or other petroleum resources located at ultra-deepwater depths.

(10) **ULTRA-DEEPWATER TECHNOLOGY**.--The term "ultra-deepwater technology" means a discrete technology that is specially suited to address 1 or more challenges associated with the exploration for, or production of, natural gas or other petroleum resources located at ultra-deepwater depths.

(11) **UNCONVENTIONAL NATURAL GAS AND OTHER PETROLEUM RESOURCE**.--The term "unconventional natural gas and other petroleum resource" means natural gas and other petroleum resource located onshore in an economically inaccessible geological formation, including resources of small producers.

SEC. 999H. FUNDING.

(a) *Oil and Gas Lease Income*.--For each of fiscal years 2007 through 2017, from any Federal royalties, rents, and bonuses derived from Federal onshore and offshore oil and gas leases issued under the Outer Continental Shelf Lands Act (43 U.S.C. 1331 et seq.) and the Mineral Leasing Act (30 U.S.C. 181 et seq.) which are deposited in the Treasury, and after distribution of any such funds as described in subsection (c), $50,000,000 shall be deposited into the Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund (in this section referred to as the ``Fund''). For purposes of this section, the term ``royalties'' excludes proceeds from the sale of

royalty production taken in kind and royalty production that is transferred under section 27(a)(3) of the Outer Continental Shelf Lands Act (43 U.S.C. 1353(a)(3)).

(b) *Obligational Authority*.--Monies in the Fund shall be available to the Secretary for obligation under this part without fiscal year limitation, to remain available until expended.

(c) *Prior Distributions*.--The distributions described in subsection (a) are those required by law--

(1) to States and to the Reclamation Fund under the Mineral Leasing Act (30 U.S.C. 191(a)); and

(2) to other funds receiving monies from Federal oil and gas leasing programs, including--

(A) any recipients pursuant to section 8(g) of the Outer Continental Shelf Lands Act (43 U.S.C. 1337(g));

(B) the Land and Water Conservation Fund, pursuant to section 2(c) of the Land and Water Conservation Fund Act of 1965 (16 U.S.C. 4601-5(c));

(C) the Historic Preservation Fund, pursuant to section 108 of the National Historic Preservation Act (16 U.S.C. 470h); and

(D) the coastal impact assistance program established under section 31 of the Outer Continental Shelf Lands Act (as amended by section 384).

(d) *Allocation*.--Amounts obligated from the Fund under subsection (a)(1) in each fiscal year shall be allocated as follows:

(1) 35 percent shall be for activities under section 999A(b)(1).

(2) 32.5 percent shall be for activities under section 999A(b)(2).

(3) 7.5 percent shall be for activities under section 999A(b)(3).

(4) 25 percent shall be for complementary research under section 999A(b)(4) and other activities under section 999A(b) to include program direction funds, overall program oversight, contract management, and the establishment and operation of a technical committee to ensure that in-house research activities funded under section 999A(b)(4) are technically complementary to, and not duplicative of, research conducted under paragraphs (1), (2), and (3) of section 999A(b).

(e) *Authorization of Appropriations*.--In addition to other amounts that are made available to carry out this section, there is authorized to be appropriated to carry out this section $100,000,000 for each of fiscal years 2007 through 2016.

(f) *Fund*.--There is hereby established in the Treasury of the United States a separate fund to be known as the ``Ultra-Deepwater and Unconventional Natural Gas and Other Petroleum Research Fund".

Appendix B: RPSEA Membership and Committee Lists

RPSEA Members (as shown on website)

ACERGY US
ACUTE TECHNOLOGY SERVICES
ADVANCED RESOURCES INTERNATIONAL
AEROVIRONMENT
ALTIRA GROUP
(THE) AMERICAN GAS ASSOCIATION
ANADARKO PETROLEUM CORPORATION
APACHE CORPORATION
APEX SPECTRAL TECHNOLOGY
APS TECHNOLOGY
BAKER HUGHES
BILL BARRETT CORPORATION
BP AMERICA
BREITBURN ENERGY
BRETAGNE LLC
BROWNSTEIN HYATT FARBER SCHRECK
CAMERON/CURTISS-WRIGHT EMD
CARBO CERAMICS
CHESAPEAKE ENERGY
CHEVRON CORPORATION
CITY OF SUGAR LAND
COLORADO ENERGY RESEARCH INSTITUTE/COLORADO SCHOOL OF MINES
COLORADO OIL & GAS ASSOCIATION
CONOCOPHILLIPS
CONSERVATION COMMITTEE OF CALIFORNIA OIL & GAS PRODUCERS
CORRELATIONS COMPANY
CRANE CORPORATION
CSI TECHNOLOGIES
DELCO OHEB ENERGY, LLC
DET NORSKE VERITAS (USA)
DEVON ENERGY CORPORATION
DYNAMIC TUBULARS
ENERCREST
ENERGY CORPORATION OF AMERICA
ENERGY VALLEY
ERGON EXPLORATION
(THE) FLEISCHAKER COMPANIES
FLORIDA INTERNATIONAL UNIVERSITY
GAS TECHNOLOGY INSTITUTE
GE/VETCO

GEOTRACE TECHNOLOGIES
GREATER FORT BEND ECONOMIC DEVELOPMENT COUNCIL
GROUNDWATER SERVICES
HALLIBURTON ENERGY SERVICES
HARVARD PETROLEUM COMPANY, LLC
HOUSTON ADVANCED RESEARCH CENTER
HOUSTON OFFSHORE ENGINEERING
HOUSTON TECHNOLOGY CENTER
IDAHO NATIONAL LABORATORY
INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA
INDEPENDENT PETROLEUM ASSOCIATION OF MOUNTAIN STATES
INTEGRATED OCEAN DRILLING PROGRAM
INTERSTATE OIL AND GAS COMPACT COMMISSION
JACKSON STATE UNIVERSITY
K. STEWART ENERGY GROUP
KNOWLEDGE RESERVOIR
LAWRENCE BERKELEY NATIONAL LABORATORY
LAWRENCE LIVERMORE NATIONAL LABORATORY
LOS ALAMOS NATIONAL LABORATORY
LOUISIANA STATE UNIVERSITY
MARATHON OIL COMPANY
MASSACHUSETTS INSTITUTE OF TECHNOLOGY LABORATORY FOR ENERGY & THE ENVIRONMENT
MERRICK SYSTEMS
MISSISSIPPI STATE UNIVERSITY
NALCO COMPANY
NATURAL CARBON
NEW ENGLAND RESEARCH
NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY
NEW MEXICO OIL & GAS ASSOCIATION
NGAS RESOURCES, INC.
NICO RESOURCES
NOBLE CORPORATION
NOVATEK
OILFIELD TECHNOLOGY NEEDS ASSESSMENT
OKLAHOMA INDEPENDENT PETROLEUM ASSOCIATION
OXANE MATERIALS
(THE) PENNSYLVANIA STATE UNIVERSITY
PETRIS TECHNOLOGY
PETROLEUM TECHNOLOGY TRANSFER COUNCIL
PIONEER NATURAL RESOURCES COMAPNY
PROVIDENCE TECHNOLOGIES
QUANELLE
RICE UNIVERSITY
ROBERT L. BAYLESS, PRODUCER
ROCK SOLID IMAGES

RTI ENERGY SYSTEMS
SANDIA NATIONAL LABORATORIES
SCHLUMBERGER
SHELL EXPLORATION & PRODUCTION
SIMMONS & COMPANY INTERNATIONAL
SITELARK *(PENDING)*
SOUTHWEST RESEARCH INSTITUTE
STANFORD UNIVERSITY
STATOIL GULF OF MEXICO
STRATA PRODUCTION COMPANY
STESS ENGINEERING
TECHNIP
TECHNOLOGY INTERNATIONAL
TENARIS GLOBAL SERVICES
TEXAS ENERGY CENTER
TEXAS ENGINEERING EXPERIMENT STATION, TEXAS A&M UNIVERSITY SYSTEM
TEXAS INDEPENDENT PRODUCERS & ROYALTY OWNERS ASSOCIATION
TEXAS TECH UNIVERSITY
TOTAL E&P USA
UNIVERSITY OF ALABAMA
UNIVERSITY OF ALASKA FAIRBANKS
UNIVERSITY OF HOUSTON
UNIVERSITY OF KANSAS
UNIVERSITY OF MICHIGAN
UNIVERSITY OF OKLAHOMA
UNIVERSITY OF SOUTH CAROLINA
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Mr. Thomas E. Williams	Noble Drilling Corporation
Mr. C. Michael Ming – RPSEA President	RPSEA

RPSEA Strategic Advisory Committee (SAC)

Strategic Advisory Committee Member	Affiliation
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Ralph Cavanagh	Natural Resources Defense Council
Peter Dea	Independent
Dr. Steven Holditch - Chairman	Texas A&M University
Melanie Kenderdine	Gas Technology Institute
Vello Kuuskraa	Advance Resources International
Daniel Lopez	New Mexico Institute of Mining & Technology
Dirk McDermott	Altira Group
Michael Ming	RPSEA
Dr. Ernest Moniz	Massachusetts Institute of Technology
Mark Murphy	Strata Production
Donald Paul	Chevron
William Schneider	Newfield Exploration

RPSEA Ultra-Deepwater PAC

Name	Organization
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Christopher Haver	Chevron
Jenifer Tule-Gaulden	Anadarko
Philippe Remacle	Total
Arnt Olufsen	Statoil
Luiz Souza	Petrobras
Maurizio Zecchin	ENI
Rick Mitchell	Devon
Dr. Oliver Onyewuenyi	Shell
Tom Williams	Noble Corporation (ex-officio)
Gary Covatch	NETL (ex-officio)
Roy Long	NETL (ex-officio)

RPSEA Unconventional Onshore PAC

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Mark Malinowski	Rosewood Resources, Inc.
David Martinueau	Pitts Energy
Richard Sullivan	Anadarko Petroleum Corporation
Bill Van Wie	Devon Energy Corporation
John Lewis	Noble Energy
Mark Glover	BP America
Dr. Julio Friedman	Lawrence Livermore National Lab
Brook Phifer	Nico Resources
Kurt Reinecke	Bill Barrett Corp.
Dr. John Lee	Texas A&M University
Bob Stayton	Weatherford International Ltd.
Dr. Valerie Jochen	Schlumberger Limited
Dr. Dag Nummedal	Colorado School of Mines (CERI)
Dr. Nafi Toksoz	Massachusetts Institute of Technology
Roy Long	DOE (NETL), Ex-Officio
Virginia Weyland	DOE (NETL) Ex-Officio

Small Producer Research Advisory Group

Name	Organization
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Bob Kiker	PTTC Permian Basin, Midland, TX
Chuck Boyer	Schlumberger, Pittsburgh, PA
Dr. Douglas Patchen	WVU, Morgantown, WV
Dr. Iraj Irshaghi	USC, Los Angeles, CA
Dr. Charles Mankin	University of Oklahoma, Norman, OK
Don Solanas	Arrowhead Exploration, Baton Rouge, LA
Roy Long	DOE (NETL), Ex-Officio
Chandra Nautiyal	DOE (NETL), Ex-Officio

Environmental Advisory Group

Name	Organization
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Dr. Steve Bryant	University of Texas
Dr. David Burnett	Texas A&M University
Bob Gordan	Stress Engineering
Russ Johns	University of Texas
Pam Matson	Stanford University
Chuck Newell	Groundwater Services
Scott Reeves	Advanced Resources, Inc.
Øyvind Strøm	Statoil (Houston)
Mason Tomson	Rice University
Scott Anderson	Environmental Defense
Sharon Buccino	NRDC
Assheton Carter	Conservation International
Joe Kiesecker	The Nature Conservancy
Roy Long	NETL

Appendix C: RPSEA Input to 2008 Draft Annual Plan

The RPSEA 2007 DAP, as received, was included as an Appendix to the 2007 Annual Plan (DOE/NETL-2007/1294). Key elements of the 2007 Annual Plan were incorporated into this document, with modification, as appropriate.

RPSEA provided input into this *2008 Annual Plan*, in the form of comments and suggested changes to the 2007 Annual Plan. The 2007 Annual Plan was designed as a two year plan, so the modifications have been relatively minor. These comments and changes are included below.

Appendix B: RPSEA Membership and Committee Lists
Update lists to reflect most recent membership rosters.

Executive Summary
Replace the first paragraph on page 5 with the following:

The Unconventional Natural Gas and Other Petroleum Resource Program Element is divided into three theme areas that target gas shales, water management for both coalbed methane and gas shales, and tight sands. In order to provide maximum impact within the limited available funding, the 2008 Annual Plan focuses on unconventional natural gas rather than "other petroleum resources" (e.g., oil shale, oil sands, deep gas) where R&D to help convert resources into reserves is needed. There are many similar, if not identical, needs across resources such as shales containing both oil and natural gas which are drilled, completed, and produced in the same way as purely gas shales. In this instance those technologies which cross cut resources and adhere to the descriptions of one of the three Areas of Interest may also be included.

The first two paragraphs on Page 11 under section labeled "Consortium Selection" need to have the RPSEA member numbers and distribution updated according to the attached ppt file.

Section 2.1 Ultradeepwater Program Element
Make changes according to the following edits to pages 17 through 27 of the 2007 Annual Plan:

- *Ultra-deepwater technology* -- a discrete technology that is specially suited to address one or more challenges associated with the exploration for, or production of, natural gas or other petroleum resources located at UDW depths.

B. Goals

The goals of the UDW program element are to increase the size of the UDW resource base and to convert currently identified (discovered) resources into economic recoverable (proven) reserves while protecting the environment, thereby providing the U.S. consumer with secure and affordable petroleum supplies. These goals will be achieved by:

1. Reducing the costs to find, develop, and produce such resources,
2. Increasing the efficiency of exploration for such resources,
3. Increasing production efficiency and ultimate recovery of such resources,
4. Improving safety, and
5. Improving environmental performance, by minimizing any environmental impacts associated with UDW exploration and production.

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This goal has been quantified through two targets described in Table 2.1. These targets are to be achieved within the 2007-2017 time frame.

Goal	Target Metric
Increase the size of the UDW resource base through new technology development and dissemination.	The 2000 MMS Assessment indicated that more than 50 billion recoverable barrels oil equivalent (BOE) remains to be discovered. The goal over the course of the program is to develop the technologies required to help identify and discover 2% or more (2% is the equivalent of two 500 MMBOE fields or ten 100 MMBOE fields) of this potential. At current commodity prices this goal would be valued in excess of $60 billion. Achievement of this goal would mean over a 400:1 return on investment.
Convert currently identified (discovered) resources into economic recoverable (proven) reserves	The MMS 2006-022 Report identifies a gap of 9 BBOE between proven reserves and the discovered resource base (Figure 2.1). The program goal is to add 100 MMBOE and more to the technically recoverable resource. At current commodity prices this goal would be valued in excess of $6 billion, roughly a more than 40:1 return on Program investment (additive to the target metric above).

Table 2.1: Goals and Target Metrics for the UDW Program

EPAct 2005 Section 999 – Annual Plan 17
August 1, 2007

Objective #3: *Ultra-Deepwater Technology Development* – Design and administer multiple rounds of solicitations for R&D contracts designed to meet the stated goal of the UDW program element. Successfully administer a selection process that results in a portfolio of R&D contracts that will best achieve that goal. Given the limited amount of funding, pay special attention to the selection of only those projects that are deemed most likely to result in significant increases in value through cost reduction, efficiency improvement, and effectiveness.

Mid-Term (2009-2012) Deleted: 07

Objective #4: *Ultra-Deepwater Technology Development and Deployment* – Through assessment of R&D results and additional solicitations (as needed), continue the development and maturation of the most promising technologies identified during the first round of solicitations. Maintain a strong focus on deployment and commercialization. Terminate weaker prospects and focus budget and efforts on those technologies that carry the greatest potential for meeting the UDW program element goal.

Objective #5: *Environmental Technology Development and Deployment* – Work with appropriate regulatory agencies, academia, industry and other key stakeholders to identify strategies to improve environmental performance during deepwater development, and develop and administer solicitations for contracts to develop technologies that can achieve this improvement.

Objective #6: *Safety Technology Development and Deployment* – Work with appropriate regulatory agencies, academia, industry and other key stakeholders to identify strategies to improve safety performance during deepwater development, and develop and administer solicitations for contracts to develop technologies that can achieve this improvement.

Long-Term (2012-2017) Deleted: 07

Objective #7: *Technology Demonstration* – Work with industry, appropriate regulatory agencies, and other key stakeholders to provide seed-level funding and other incentives for demonstration and validation of newly developed technologies.

Objective #8: *Technology Commercialization* – Work with industry, appropriate regulatory agencies, and other key stakeholders to provide seed-level funding and other incentives to ensure commercialization of emerging technologies.

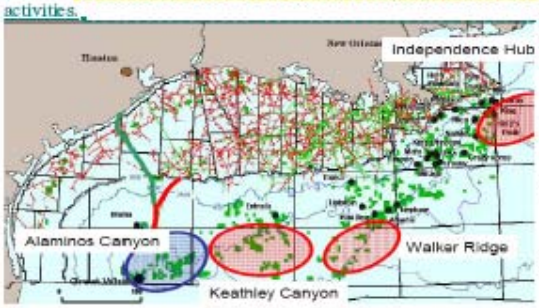
D. Implementation Plan

The UDW program element will be implemented in a different manner than the other two parts of the consortium-administered program (Unconventional Resources and Small Producer elements) which focus on broader research topics. EPAct states the UDW program element "*shall focus on the development and demonstration of individual exploration and production technologies as well as integrated systems technologies including new architectures for production in ultra-deepwater.*" RPSEA has

EPAct 2005 Section 999 – Annual Plan 19
August 1, 2007

Identification of Focus Areas for New Technology Development

In developing the list of focus areas for solicitations, DeepStar performed a systems engineering study based on industry UDW experience and needs. Four base case field development scenarios were identified as representative of future Gulf of Mexico UDW developments with technical barriers which challenge development. These scenarios are drawn from four key areas of activity in the deepwater Gulf of Mexico (Walker Ridge, Keathley Canyon, Alaminos Canyon and the Eastern Gulf), and the associated technology challenges (Figure 2.2). Four generic fields were created (Canopy, Gumout, Coyote, and Diablo) based upon the areas of current activity. Each of the generic fields is characterized by a unique design feature currently hindering technical and economic development (Table 2.3). The field development scenarios will be further matured into design basis and will be used as input for the UDW Program Element activities. The systems engineering study will be revisited periodically over the duration of the UDW Program to ensure relevance with ongoing industry exploration and development activities.



Walker Ridge / Keathley Canyon
- sub-salt
- deeper wells
- tight formations

Alaminos Canyon
- viscous crude
- lacking infrastructure

Eastern Gulf – Gas Independence Hub
- higher pressure & temp.
- CO_2 / H_2S

Overall
- higher drilling costs

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Figure 2.2: Technical challenges for identified basins

Table 2.3: UDW Base Case Scenarios

Field Type	Technology Challenge	Development Options
Canopy Field	Low Permeability Reservoir	Semi with Wet Trees
		FPSO with Wet Trees
		FPSO EPS
		Produce to Beach
Gumout Field	High Viscosity Oil	Dry Tree Structure
		Satellite Tieback to Host
Coyote Field	Small Reserve Fields	Satellite Tieback to Host
Diablo Field	XHPHT (22.5 ksi x 350+°F)	Semi w/ Gas Sweetening
		Produce to Beach thru Sour Gas Pipeline

Prioritization of Technology Development Needs

The nine TACs were provided systems engineering study input by reviewing the four base case scenarios and identifying the highest priority technology "themes" required to bridge technology challenges and remove barriers to development. Identified themes are listed in Table 2.4a. A number of the themes identified are either multi-disciplinary or cut across several TAC discipline areas. Accordingly, the themes have been categorized either by specific base case or crosscutting.

The UDW TACS further refined the 33 themes into specific project ideas which address one or multiple themes. The process included the development of more than 100 project ideas, which were proposed by the TACs themselves or by any interested/knowledgeable entity involved in the process. All project ideas were compiled and reviewed by each TAC, which then refined and combined similar ideas, refined the Scope of Work, identified deliverables, and estimated the schedule and costs. Each TAC ranked the resulting respective list of project ideas and submitted the highest ranking project ideas to the PAC. The PAC evaluated and prioritized the projects from all TACs. The PAC prioritization was based upon projected project impact, available budget, and alignment with overall Program Goals. The prioritization process used by the PAC called for each of the eleven UDW Operating Companies in the PAC to select project ideas (up to a total of $36 million) which, from their company's perspective, would do the most to bridge technology gaps of particular relevance to their operations and meet the goals of the RPSEA UDW Program. Only those project ideas receiving a majority vote (6 of 11 companies) were considered.

Selected project ideas are listed in Tables 2.4b and 2.4c for Year 1 (2007) and Year 2 (2008) solicitations. These Projects can be categorized as addressing one of 4 major development and operation challenges currently pursued by the worldwide UDW community. These are:

1. Significantly extend subsea tieback distances / surface host elimination,
2. Enable dry trees and risers in 10,000' water depths,
3. Cost effective subsea intervention,
4. Continuous Improvement
    i. Per wellbore recovery
    ii. Cost Reduction

Development of Solicitations

Each of the top-ranked proposed project ideas listed in Tables 2.4b and 2.4c has been converted by RPSEA into a Request for Proposal (RFP). These RFPs have been separated into multiple Solicitations. Year 1 (2007) solicitations were released in late 2007. The solicitations were released on the RPSEA and DOE websites for a minimum period of 45 days (see Section 2.4 for further details on the solicitation process).

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Project Number	Project Description	Applicable Themes (see Table 2.4a)
Extend subsea tieback distances / surface host elimination		
DW1301	Multiphase Meter Technology : Improvements to Deepwater Subsea Measurement	11, 12, 16, 24, 25, 26, 28
DW1302	Ultra-high Conductivity Umbilicals	26, 28, 31
DW1901	Subsea Processing System Integration Engineering	5, 11, 12, 26, 27, 28, 30, 31
DW1201	Wax Control	5, 16
DW1902	Deep Sea Hybrid Power System	11, 26, 27, 28, 29, 31
DW1501	Extreme Reach Development	31, 32
Enable dry trees and risers in 10,000' water depths		
DW1401	Carbon Fiber Wrapped High Pressure Drilling and Production Riser Qualification Program	7, 11, 13, 15, 31
DW1402	Ultra-deepwater Dry Tree System for Drilling and Production in GOM	13, 24, 31
DW1403	Fatigue Performance of High Strength Riser Materials	7, 15, 28
Cost effective subsea intervention		
DW1502	Coil Tubing Drilling and Intervention System Using Cost Effective Vessels	2, 4, 5, 11, 23, 24, 25, 29, 31
Continuous Improvement		
DW1701	Improved Recovery	2, 3, 18, 19, 23, 24, 25, 31
DW2001	Synthetic benchmark models of complex salt	17
DW1801	Effect of Global Warming on Hurricane Activity	11, 20
Other		
DW1603	Graduate Student Design Projects	30, 31
DW1604	Small Business Initiative	33

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Table 2.4b: UDW Program Element Solicitation Topics (2007)

Project Number	Project Description	Applicable Themes (see Table 2.4a)
Extend subsea tieback distances / surface host elimination		
DW2901	Reliable deepwater power distribution & components (Component Qualification - performed in steps.)	26, 27, 28, 31
DW1202	EOS improvement for xHPHT	8, 9, 18, 23, 25
DW2201	Viscous Oil PVT	2, 5, 16, 18
Cost effective subsea intervention		
DW2301	Deepwater Riserless Light Well Intervention	2, 4, 11, 23, 24, 25, 29, 31
DW2501	Early Reservoir Appraisal, Utilizing a Low Cost Well Testing System - Phase 1	9, 11, 13, 18, 23, 24, 25, 31
Continuous Improvement		
DW2701	Resources to Reserves Development and Acceleration through Appraisal	9, 18, 23, 24, 25, 31
DW2502	Modeling and Simulation of Managed Pressure Drilling for Improved Design, Risk Assessment, Training and Operations	6, 11, 31
DW2101	New Safety Barrier Testing Methods	10, 11
DW2801	Gulf 3-D Operational Current Model Pilot	21, 22

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Table 2.4c: UDW Program Element Solicitation Topics (2008)

Funds Available and Anticipated Awards

The UDW Program will have $14.96 million per year available for project awards. It is anticipated that the UDW Program Element, in the initial year, will award 5-14 projects ranging from $250K to $3 MM having an average Federal government contribution of $750K and a project period of 1-3 years.

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E. Metrics

The goals of the UDW program element are to increase the size of the UDW resource base and to convert currently identified (discovered) resources into economic recoverable reserves while protecting the environment, thereby providing the U.S. consumer with

secure and affordable petroleum supplies. The long term metrics for this program element and the Consortium in general are discussed in Section 2.5.

Shorter-term metrics include the completion of annual milestones that show progress towards meeting the program element objectives. As a minimum, short term metrics for the end of FY 2007 through FY 2008 shall include:

- Prioritize Proposed Projects.
- Issue 2-3 solicitations.
- Select and award a minimum of 5 projects.
- Establish FY 2009 R&D priorities based on results of 2007-08 solicitations and inputs from the TACs and PAC.

In addition, the UDW Program will continue to acquire and analyze the data necessary to accurately quantify base case and post technology application case assessments of proved and unproved reserves in order to accurately quantify the incremental reserves attributable to specific program-developed technologies. These assessments will include estimates of the value of goods and services created from the products developed by this program element. In addition, the program will continue to acquire data to validate/calibrate the MMS Assessment of remaining discoverable, recoverable resources. Determination of the UDW program benefits will be fully coordinated with NETL's Office of Systems, Analysis, and Planning.

F. Milestones

The first Solicitation will remain open for 45 days (see Table 2.5). The review selection and award process will take approximately two and one half months. A second Solicitation will be released 4 months after plan approval, with a third solicitation planned for 7 months after plan approval dependent upon funding availability.

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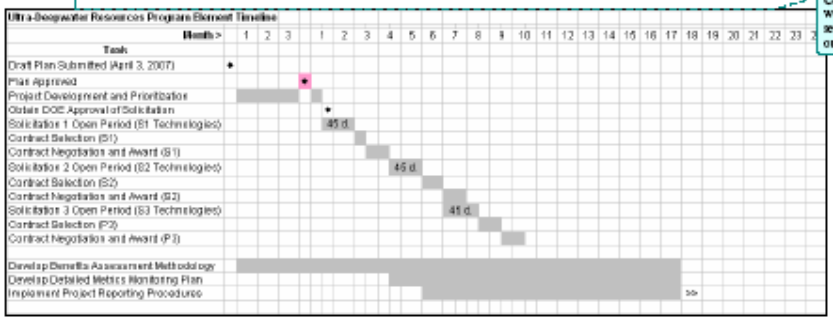
The following steps are represented on the timeline:

1. DAP Submittal (completed)
2. Technology Theme Refinement
   Report justifying rationale for theme selection and final prioritization
3. Annual Plan Approval
4. Project Development and Prioritization (underway)
5. Obtain DOE Approval of Solicitation
6. Solicitation 1
   Solicitation Open Period
   Proposal Evaluation and Selection
   DOE Approval of Selections
   Contract Award
7. Solicitation 2
   Solicitation Open Period
   Proposal Evaluation and Selection
   DOE Approval of Selections

Contract Award

8. Solicitation 3 (if warranted)
   Solicitation Open Period
   Proposal Evaluation and Selection
   DOE Approval of Selections
   Contract Award
9. Develop and apply methodology for quantifying benefits as a result of the application of program-developed enabling technologies.
10. Establish FY2009 R&D priorities based on results of 2007-08 solicitations, inputs from the program advisory committees, and modeling of the impacts of various R&D applications.
11. Monitor progress of all awards and make any necessary adjustments to research plans.
12. Satisfactorily report all program deliverables to NETL.

Table 2.5: UDW Program Element Timeline



Comment [haverca1]: We need to work with NETL to revise this entire section. The timeline no longer reflects our plans.

Section 2.2 Unconventional Natural Gas and Other Petroleum Resources Program Element

Make the following changes on the identified pages, beginning on page 28 and continuing through page 34.

p. 28 Section B – Goal

Replace second paragraph with the following two paragraphs:

The contribution of natural gas to the Nation's gas supply from three specific unconventional resources—gas shales, coal seams, and tight sands—has grown significantly during the past 20 years. These resources have been highlighted by the Energy Information Administration (EIA) and others as critical supply sources during the next 20 years. According to the latest estimate by the National Petroleum Council (NPC 2003) the volume of technically recoverable gas from these three resources in the lower 48 states is in excess of 293 trillion cubic feet (TCF). Due to their potential and critical significance, and in view of the limited resources available to the research program, gas shales, tight gas sands, and coalbed methane were determined to be the unconventional resources to be specifically addressed in the initial years of the program. Opportunities to leverage developed technologies through application to other unconventional natural gas and petroleum resources will be sought, and other petroleum resources may be specifically targeted in subsequent years, should funding be extended under EPAct or other legislation.

In order for the program to be successful in adding to the Nation's resource base through new technology, the transfer of that technology to companies operating in the targeted resources will need to be an integral part of the program planning and execution. Additionally, any development of new resources must be accomplished in an environmentally acceptable manner, so it will be important that technologies developed under the program be applied in ways that minimize the impact of resource development on natural and cultural resources.

p. 31 Long Term (2007-2017) Objectives

Just after Objective 5, insert the following text from the 2007 solicitation:

Development of an Integrated Program
An important aspect of this solicitation is encouragement of teaming efforts to address integrated production needs of a particular unconventional gas resource. To the extent possible, integration of geologic concepts with engineering issues coupled to production and environmental issues is encouraged. The intent is to develop a coordinated program as opposed to individual projects such that the whole has much greater value than the sum of the parts.

It is anticipated that several iterations of program development may be required to design the optimum program. RPSEA will take steps to integrate projects on an ongoing basis to assure a program focus.

p. 31 Section D. Implementation Plan

The second and third paragraphs will need to be revised to reflect the status of the program at the time the Annual Plan is prepared. If the awards from the 2007 solicitation have been made, this section could summarize the nature of the project portfolio and perhaps indicate some particular areas of emphasis in the 2008 solicitations designed to fill in "gaps" in the portfolio. Since it is probably optimistic to expect that we will have finalized the 2008 RFPs at the time the Annual Plan is submitted to the URTAC, we might just point out that the RFP will cover the same areas of interest as the 2007 plan, but with some additional focus based on the portfolio of projects generated by the 2007 awards. We could consider the following changes to the bullet items listed in the three areas of interest, with a proviso that they are subject to modification based on ongoing program results.

In addition minor edits are suggested in the descriptions of Area of Interests 1 and 3, as shown below, in order to clarify that the program is not restricted to resources that have been traditionally classified as "gas shales" or "tight gas sands".

p. 32 Area of Interest 1: Gas Shales

Replace the first sentence after the heading with the following:

Scope: The solicitation will request ideas and projects for development of tools, techniques, and methods that may be applied to substantially increase, in an environmentally sound manner, commercial production and ultimate recovery from the established gas shale formations and accelerate development of gas from emerging and Frontier shale plays.

Replace the list of bulleted items with the list from the solicitation issued in October 2007.

Add the following bullet, possibly as the second bullet in the list:

Comprehensive characterization of the geological, geochemical and geophysical framework of shale gas resource plays, particularly emerging plays.

p. 33 Area of Interest 2: Water Management Associated with Coalbed Methane and Gas Shale Production

Replace the list of bulleted items with the list from the solicitation issued in October 2007.

p. 33 Area of Interest 3: Tight Sands

Replace the first sentence after the heading with the following:

Scope: The solicitation will request proposals for development of tools, techniques, and methods to increase, in an environmentally sound manner, commercial production and ultimate recovery from established tight gas sand formations and accelerate development of gas from emerging and frontier tight sand plays

Replace the list of bulleted items with the list from the solicitation issued in October 2007.

Add the following bullet, possibly as the second bullet in the list:

Comprehensive characterization of the geological, geochemical and geophysical framework of tight sand resource plays, particularly emerging plays.

p. 34 Add technology transfer discussion to Section D.

Consider adding a paragraph such as that below after the "Funds Available and Anticipated Awards" discussion, just prior to Section E. Metrics.

Technology Transfer

The program cannot have the desired impact on the Nation's energy supplies if the technologies developed under the program are not applied by the companies engaged in the development of domestic gas resources. While 2.5% of the amount of each contract is allocated to formal technology transfer activities, engagement of industry throughout the technology development cycle will be crucial. The advisory committees responsible for selection of projects and initial and ongoing evaluation of project progress have substantial industry representation, specifically selected to represent those companies best positioned to be the initial adopters of technology developed under the program. Thus, formal technology transfer activities will be supplemented by the essential engagement of industry in the active execution of the program.

Section 2.3 Small Producer Program Element

Make the following changes on the identified pages, beginning on page 37 and continuing through page 39.

p. 37, Section 2.3 C.

Replace the first complete paragraph on p. 37 (beginning with "The Small Producer Program Element, perhaps …) with the following three paragraphs:

The small producer community is quick to adopt new technology that has been shown to have an economic benefit in their operating environment, but does not generally have the time or resources to provide a test bed for technology development efforts or the demonstration of new applications of existing technology. The small producer program element has a crucial role in ensuring that leading edge exploration and production technology is made available to small producers, allowing them to maximize their important contribution to the nation's secure energy supply.

The approach to enhancing the impact of small producers on energy production involves two related but distinct activities. First, individual small producers facing representative challenges will be engaged to work with technology providers on the development and application of technology to enhance economic and environmentally responsible production and resource recovery. The support provided through the program will mitigate the economic risk normally associated with the new application of unproven technology. Second, the information acquired as a result of projects funded through the program will serve as the basis for technology transfer efforts that will promote appropriate novel technology applications throughout the small producer community.

While only 2.5% of the amount of each contract is specifically set aside for funding technology transfer, the entire program will be planned and executed with the knowledge that the desired impact will not be achieved without significant transfer of technology beyond the direct participants in funded projects. Projects will be scoped and funded to ensure that the necessary materials are developed to support the required technology transfer activities and that the necessary participants have the support to fully participate in technology transfer events. In order to obtain the greatest leverage for technology transfer funds, RPSEA will make maximum use of existing technology transfer networks and organizations.

p. 39, Section D. Implementation Plan

Add the following bullet:

Creative capture and reuse of industrial waste products (CO_2, produced water, excess heat) to reduce operating costs or improve recovery.